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LAKE MICHIGAN WATER QUALITY REPORT

1980

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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Cover: Chicago Skyline and Monroe Harbor Lighthouse

LAKE MICHIGAN

WATER QUALITY REPORT

JANUARY THROUGH DECEMBER 1980

by

THE CITY OF CHICAGO
DEPARTMENT OF WATER
BUREAU OF WATER OPERATIONS
DIVISION OF WATER PURIFICATION
WATER QUALITY SURVEILLANCE SECTION

and

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL

JUNE, 1981

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TABLE OF CONTENTS

Page

List of Figures.. iii

List of Tables... iv

Water Quality Evaluation Summary, 1980.............................. 1

Introduction... 4

Section A

I. Open Water Survey.. 6

II. North Shore Lake Survey....................................... 9

III. South Shore Lake Survey...................................... 12

IV. Jardine Water Purification Plant Radial Survey................ 16

V. South Water Filtration Plant Radial Survey..................... 20

VI. Phytoplankton Monthly Variation, 1980......................... 24

Section B Water Quality Trend Analysis............................. 27

Section C Status of Dischargers and Water Quality Events........... 39

Section D Toxics Monitoring.. 42

Section E Macroinvertebrates....................................... 47

Section F Literature Cited... 50

Section G Glossary of Terms.. 51

Appendix A Survey data sheets...................................... 62

List of Figures

Figure Page

1 Locations of lake survey stations.................................... 5
2 Locations of Open Water Survey stations............................ 7
3 Locations of North Shore Lake Survey stations..................... 10
4 Locations of South Shore Lake Survey stations..................... 13
5 Locations of Jardine Water Purification Plant Radial Survey stations....................................... 17
6 Locations of South Water Filtration Plant Radial Survey stations....................................... 21
7 Monthly summary of phytoplankton data collected at the crib intake of the Jardine Water Purification Plant.............. 25
8 Total coliform trends in Lake Michigan, 1970-1980................. 28
9 Average and maximum concentrations of total coliform, 1971-1980.. 29
10 Fecal coliform trends in Lake Michigan, 1970-1980.................. 30
11 Geometric mean and maximum concentrations of fecal coliform, 1971-1980.. 31
12 Total phosphate trends in Lake Michigan, 1970-1980................. 33
13 Average and maximum concentrations of total phosphate, 1971-1980.. 34
14 Ammonia nitrogen trends in Lake Michigan, 1970-1980................ 35
15 Average and maximum concentrations of ammonia nitrogen, 1971-1980.. 36
16 Phytoplankton trends in Lake Michigan, 1970-1980................... 37

List of Tables

Table Page

1 Lake Michigan water quality summary, 1980 3
2 Water quality summary of Open Water Lake Survey 8
3 Water quality summary of North Shore Lake Survey 11
4 Water quality summary of South Shore Lake Survey 15
5 Water quality summary of Jardine Water Purification Plant Radial Lake Survey 18
6 Water quality summary of South Water Filtration Plant Radial Lake Survey 22
7 Sediment concentrations of volatile solids, nitrogen, phosphorus, chemical oxygen demand, and metals at eight Lake Michigan stations and at one Indiana Harbor station, 1980 44
8 Concentrations of various contaminants in composite samples of coho salmon collected near Kellogg Creek in northern Illinois 45
9 Sample depth, bottom type, total number of macroinvertebrates and number of taxa at nine Lake Michigan stations and one Indiana Harbor station, 1980 48
10 Aquatic macroinvertebrates collected at nine Lake Michigan stations and one Indiana Harbor station, 1980 49
11 Open water survey data, March 26, 1980 63
12 Open water survey data, May 15, 1980 64
13 Open water survey data, June 17, 1980 65
14 Open water survey data, September 25, 1980 66
15 North shore lake survey data, January 17, 1980 67
16 North shore lake survey data, May 1, 1980 68
17 North shore lake survey data, May 20, 1980 69
18 North shore lake survey data, June 24, 1980 70
19 North shore lake survey data, July 29, 1980 71
20 North shore lake survey data, September 4, 1980 72

21 North shore lake survey data, October 7, 1980 73
22 North shore lake survey data, November 6, 1980 74
23 South shore lake survey data, March 20, 1980 75
24 South shore lake survey data, May 6, 1980 76
25 South shore lake survey data, June 12, 1980 77
26 South shore lake survey data, July 1, 1980 78
27 South shore lake survey data, August 5, 1980 79
28 South shore lake survey data, August 28, 1980 80
29 South shore lake survey data, September 16, 1980 81
30 South shore lake survey data, October 30, 1980 82
31 South shore lake survey data, November 13, 1980 83
32 J.W.P.P. radial lake survey data, April 8, 1980 84
33 J.W.P.P. radial lake survey data, June 5, 1980 85
34 J.W.P.P. radial lake survey data, July 10, 1980 86
35 J.W.P.P. radial lake survey data, September 30, 1980 87
36 S.W.F.P. radial lake survey data, April 22, 1980 88
37 S.W.F.P. radial lake survey data, May 28, 1980 89
38 S.W.F.P. radial lake survey data, July 22, 1980 90
39 S.W.F.P. radial lake survey data, October 16, 1980 91
40 Detection limits and standards in water, sediment and fish samples for nine metals and ten chlorinated hydrocarbons 92

WATER QUALITY EVALUATION SUMMARY, 1980

The bacteriological and chemical data collected during 1980 when compared to the previous ten years illustrated an over all improvement in water quality for the southwestern portion of Lake Michigan. However, there were some increases for certain chemical and microbiological parameters in 1980. A summary of the annual water quality data obtained from the 1980 Lake Michigan survey program is presented in Table 1.

During the 1980 survey season, minimal total coliform levels were recorded for the North Shore while the annual average of 3/100 ml remained unchanged from 1979. Average total coliform levels for the South Shore Survey continued to remain high in comparison to the North Shore Survey. The total coliform annual average for 1980 was 1,198/100 ml, an increase from the 1979 average of 463/100 ml. Much of this increase may be attributed to the alleged overloads of sanitary wastes to the Hammond, Indiana sanitary sewer system which were discharged to Lake Michigan during periods of heavy precipitation in the summer. Apparently, this incident contributed to the closing of some Chicago beaches for 21 days during the summer and elevating bacterial levels for the South Shore area. In 1980 as in 1979, the Open Water Lake Survey averages continued to be 0/100 ml (Figure 8).

Fecal coliform geometric mean values remained three to four times higher for the South Shore Surveys than for the North Shore. Geometric mean values for the North Shore have apparently stabilized at 1.2/100 ml for 1980. The South Shore fecal coliform geometric mean increased to 3.8/100 ml from 3.3/100 ml in 1979. Both the North Shore and the South Shore geometric means were well below the Illinois Pollution Control Board (IPCB) water quality standard of 20/100 ml for Lake Michigan. The Open Water Survey geometric mean remained 0/100 ml (Table 2).

Total phosphate levels continued to increase slightly in 1980 for the North Shore, South Shore and Open Water Surveys. The IPCB water quality standard for total phosphate is 0.021 mg/l (equivalent to phosphorus, as P, of 0.007 mg/l). The North Shore, South Shore and Open Water Surveys were all in excess of this standard (Table 1). This nutrient must continue to be monitored carefully as its potential effect on the eutrophication of southern Lake Michigan is well known.

Ammonia nitrogen levels have been decreasing over the past ten years in southwestern Lake Michigan and data collected during 1980 support this trend. Average levels along the north shore and in the open water area have been below the IPCB water quality standard of 0.02 mg/l since 1976. For the first time in ten years, the South Shore Survey exhibited average ammonia nitrogen concentrations equal to the Lake Michigan water quality standard; a substantial decrease from 1979 (Figures 14 & 15). The highest ammonia nitrogen levels continue to occur off the Indiana Harbor Canal.

Table 1. Lake Michigan water quality summary, 1980.

CITY OF CHICAGO
WATER PURIFICATION DIVISION, WATER QUALITY SURVEILLANCE SECTION
SOUTHWESTERN LAKE MICHIGAN
WATER QUALITY EVALUATION
1980

PARAMETER	STANDARD	NEARSHORE less than 3mi. from shore		OFFSHORE more than 3mi. from shore		ALL STATIONS	
		AVERAGE	NO.	AVERAGE	NO.	AVERAGE	NO.
TURBIDITY T.U.		1.68	229	0.82	178	1.30	407
ODOR, THRESHOLD T.O.N.		1.30	229	1.15	178	1.23	407
CONDUCTIVITY µmhos		290.9	229	283.6	178	287.8	407
OXYGEN DEMAND, CHEMICAL mg/L		7.95	229	8.54	178	8.21	407
pH	7.0-9.0	8.4	229	8.4	178	8.4	407
RESIDUE, TOTAL NONFILTRABLE mg/L		7.15	229	6.28	178	6.77	407
RESIDUE, FILTRABLE mg/L	180			150.5	56	150.5	56
NITROGEN, ORGANIC mg/L		0.17	229	0.15	178	0.16	407
NITROGEN, AMMONIA mg/L	0.02	0.189	229	0.013	178	0.016	407
NITROGEN, NITRITE-NITRATE mg/L		0.198	229	0.196	178	0.198	407
PHOSPHATE, TOTAL mg/L	0.021	0.049	229	0.038	178	0.045	407
PHOSPHATE, DISSOLVED mg/L		0.016	229	0.014	178	0.015	407
SODIUM mg/L				3.88	56	3.88	56
POTASSIUM mg/L				1.06	56	1.06	56
CHLORIDE mg/L	12.0	8.92	229	8.41	178	8.69	407
SULFATE mg/L	24.0	21.8	228	21.6	178	21.8	406
SILICA, SiO_2 mg/L				0.697	56	0.697	56
IRON µg/L	1000	36.4	102	25.4	74	31.8	176
PHENOL LIKE SUBSTANCES µg/L	100	<1	229	<1	122	<1	351
ASBESTOS fibers/L X1000				13.81	26	13.81	26
PLATE COUNT, 48hr.-35° C per mL		1054	229	78	178	627	407
COLIFORM, TOTAL per 100 mL		499	229	3	178	282	407
COLIFORM, FECAL per 100 mL geo. mean	20	1.90	229	1.13	178	1.51	407
STREP, FECAL per 100 mL		0.67	139	0.00	40	0.53	179
FUNGI per mL		0.68	219	0.26	174	0.49	393
ACTINOMYCETES per mL		0.77	219	0.39	174	0.60	393
PLANKTON per mL		680	204	401	170	553	374

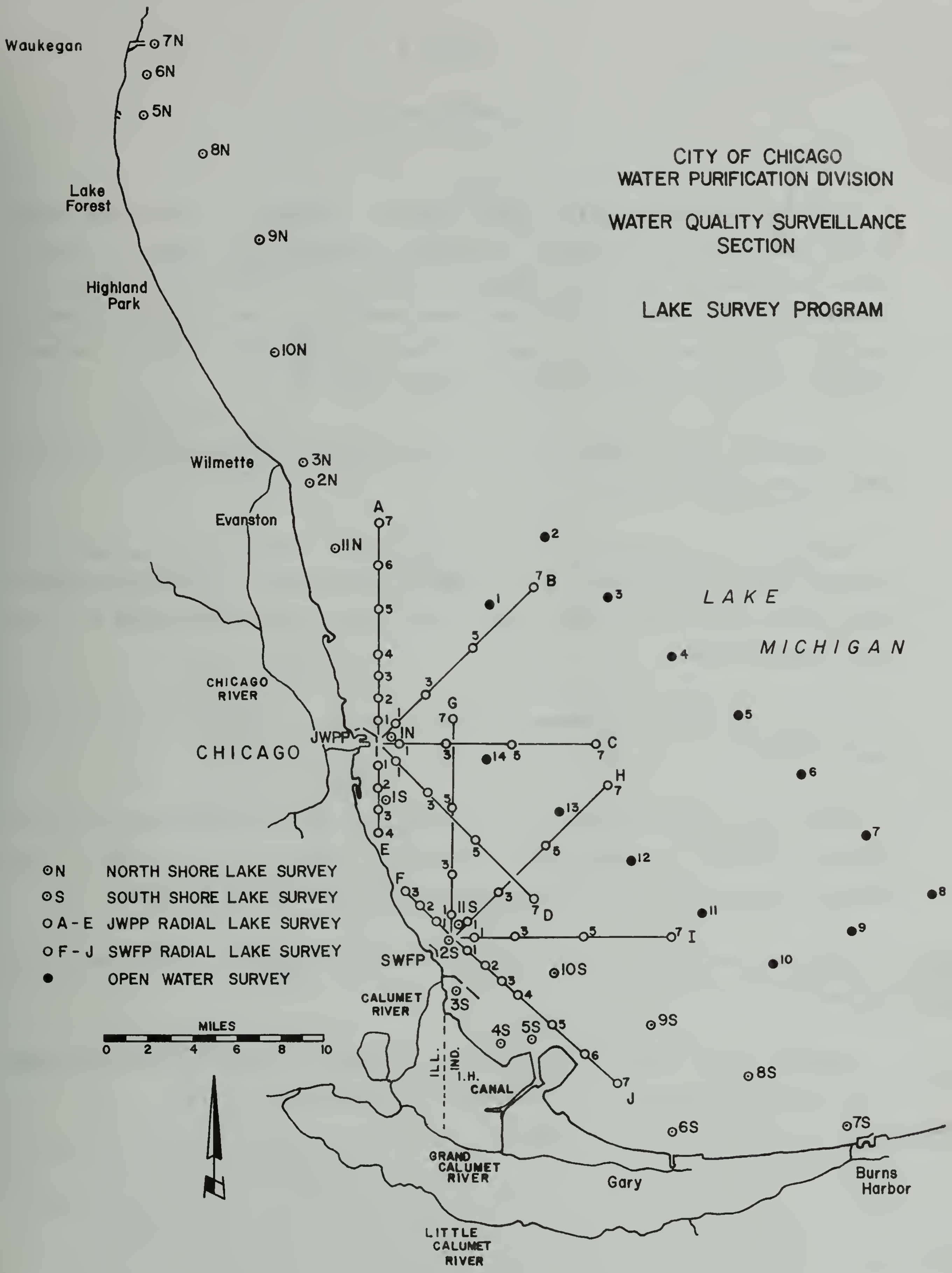
INTRODUCTION

Lake Michigan is the largest body of fresh water entirely within the boundaries of the United States. It is also the third largest of all the Great Lakes. The Great Lakes constitute the largest surface fresh water storage reservoir on earth, with the exception of the polar ice caps.

Lake Michigan provides drinking water for an estimated five million residents of northeastern Illinois. Its recreational opportunities attract fishing, boating, swimming and water-oriented interests. It is the avenue for domestic and international waterborne commerce. Its readily available water for industry and commerce encouraged the growth and development of the greater Chicago metropolitan area into one of the largest industrial-commercial complexes in the United States.

Recognizing the importance of Lake Michigan as a natural asset, the 75th Illinois General Assembly authorized the Illinois Environmental Protection Agency to "...regularly conduct water quality and lake bed surveys to evaluate the ecology and the quality of water in Lake Michigan." Monitoring programs have provided information on the condition of the Illinois waters of Lake Michigan. With data gathered on a continuing basis, it should be possible to determine long term trends in lake water quality. Locations of sampling sites for the lake survey program are shown in Figure 1. Lake water quality at the survey sites has been evaluated on the basis of the water quality standards promulgated by the Illinois Pollution Control Board, Rules and Regulations, Chapter 3: Water Pollution.

Figure 1. Locations of lake survey stations.



SECTION A

I. OPEN WATER LAKE SURVEY

Since its inception in 1977, this survey is intended to assess open water quality away from the influence of shore discharges. The data is used to detect and monitor long-term changes occurring in Lake Michigan and as a reference for data obtained from nearshore areas. The Open Water Lake Survey consists of 14 sample points located from 6 to 18 miles offshore between Evanston, Illinois and Burns Harbor, Indiana (Figure 2).

A summary of all chemical and microbiological analyses performed during 1980 is presented in Table 2.

Bacterial concentrations were down from 1979. Total coliform and fecal coliform levels were 0/100 ml at all sample stations which indicated excellent open water quality during 1980. The standard plate counts were lower at 12 of the 14 sample points.

For the last two years ammonia nitrogen levels averaged <0.01 mg/l at all sample points.

With an all station average of 0.034 mg/l in 1980, total phosphate levels increased slightly compared with last year's average of 0.032 mg/l. The annual average at each station exceeded the IPCB standard of 0.021 mg/l.

Chlorides averaged 8.4 mg/l for all stations, well below the standard of 12.0 mg/l.

Sulfate levels ranged from 19.4 to 27.0 mg/l with an all station average of 21.8 mg/l. The water quality standard for sulfate is 24.0 mg/l.

Figure 2. Locations of open water survey stations.

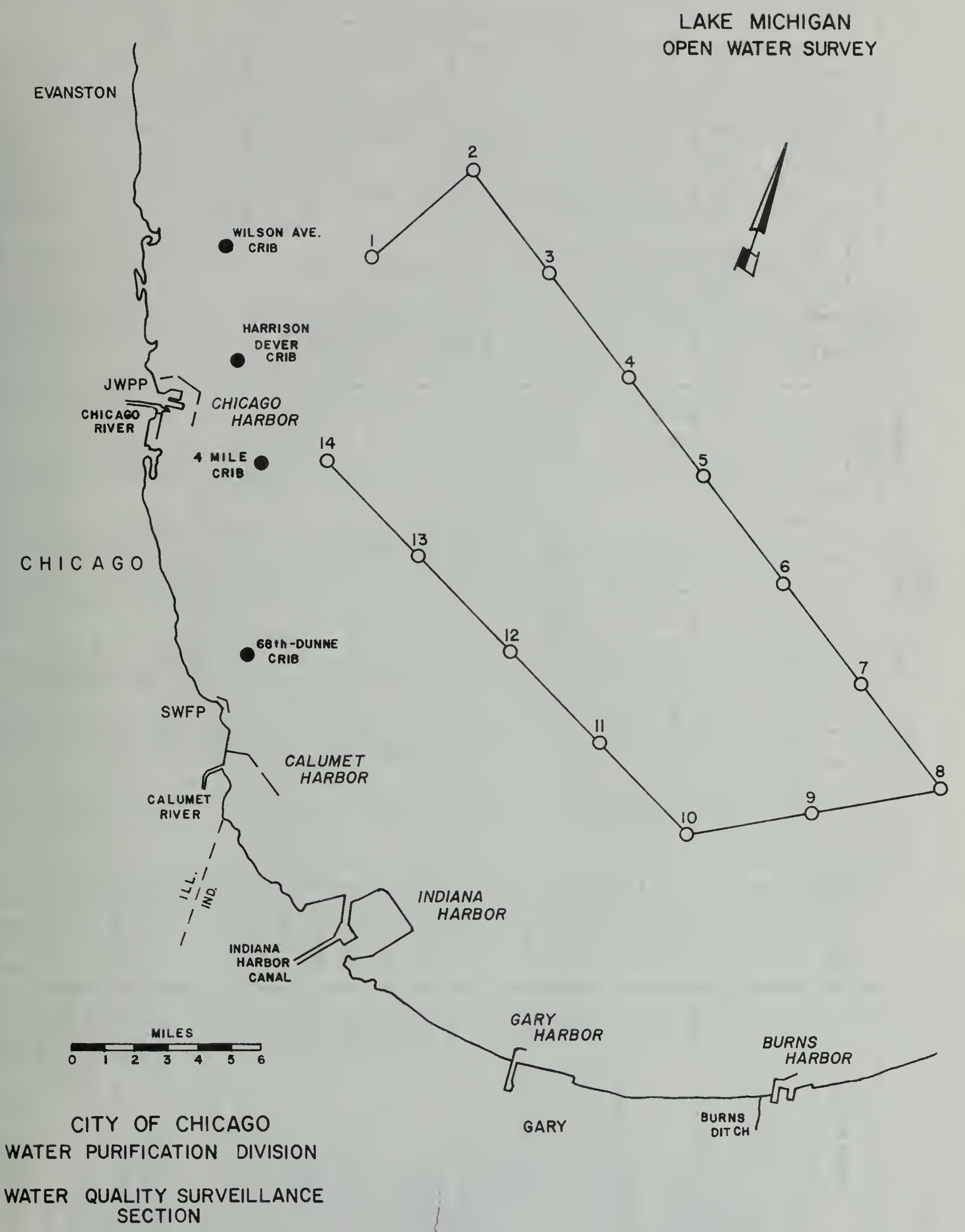


Table 2.

1980
OPEN WATER LAKE SURVEY SUMMARY TABLE

PARAMETER		STORET NUMBER	SUR-VEYS	ANNUAL MEAN													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
TURBIDITY	T.U.	00076	4	0.55	0.46	0.46	0.41	0.41	0.44	0.44	0.65	0.76	0.69	0.55	0.58	0.66	0.61
ODOR, THRESHOLD	T.O.N.	00086	4	1.5	1.0	1.5	1.3	1.5	1.3	1.3	1.0	1.0	1.0	1.3	1.3	1.3	1.0
CONDUCTIVITY	µmhos	00095	4	285	283	281	281	280	283	281	284	284	285	284	283	215	283
OXYGEN DEMAND, CHEMICAL	mg/L	00035	4	9.0	9.7	8.3	9.0	8.0	7.3	8.0	9.2	10.0	10.3	11.1	12.1	13.3	10.0
pH		00400	4	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
RESIDUE, TOTAL NONFILTRABLE	mg/L	00530	4	5.5	4.3	5.5	1.8	7.3	9.5	7.3	7.0	9.0	5.0	10.3	7.5	7.5	2.3
RESIDUE, FILTRABLE	mg/L	00515	4	153	155	150	150	148	151	149	148	150	149	153	153	149	150
NITROGEN, ORGANIC	mg/L	00605	4	0.17	0.17	0.19	0.18	0.14	0.14	0.15	0.17	0.19	0.18	0.15	0.17	0.15	0.17
NITROGEN, AMMONIA	mg/L	00610	4	< 0.01	< 0.01	<0.01	<0.01	< 0.01	<0.01	< 0.01	<0.01	<0.01	< 0.01	<0.01	< 0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE	mg/L	00630	4	0.21	0.21	0.20	0.21	0.22	0.21	0.20	0.22	0.23	0.22	0.22	0.22	0.22	0.21
PHOSPHATE, TOTAL	mg/L	00650	4	0.023	0.030	0.023	0.038	0.025	0.033	0.028	0.050	0.045	0.028	0.045	0.028	0.038	0.038
PHOSPHATE, DISSOLVED	mg/L	00653	4	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.01	0.02	0.01	0.01	< 0.01	< 0.01	< 0.01
SODIUM	mg/L	00929	4	3.8	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.8	3.9	3.8	3.9	3.9	4.1
POTASSIUM	mg/L	00937	4	1.05	1.03	1.03	1.10	1.03	1.05	1.13	1.00	1.13	1.05	1.05	1.08	1.05	1.13
CHLORIDE	mg/L	00940	4	8.3	8.4	8.4	8.1	8.4	8.1	8.4	8.6	8.3	8.6	8.5	8.3	8.5	8.4
SULFATE	mg/L	00945	4	21.3	21.5	21.8	21.5	21.7	21.9	21.3	21.6	22.5	20.7	22.1	22.5	22.2	22.1
SILICA, SiO_2	mg/L	00956	4	0.66	0.69	0.74	0.78	0.69	0.78	0.74	0.74	0.73	0.68	0.68	0.68	0.63	0.59
ASBESTOS	fibers/L X1000	00940	4		25.0		26.2		21.6		21.9		30.0		27.6		22.4
PLATE COUNT, 48hr. - 35°C	per mL	31754	4	12	12	10	2	2	2	3	1	2	70	4	0	1	3
COLIFORM, TOTAL	per 100 mL	31503	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLIFORM, FECAL	per 100 mL geo. mean	31616	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI	per mL	31856	4	0.0	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.3	0.0	0.0	0.0	0.0
ACTINOMYCETES	per mL	80148	4	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.3	0.5
PLANKTON	per mL	60050	4	70	205	280	260	210	245	230	250	315	395	510	245	275	390

II. NORTH SHORE LAKE SURVEY

The North Shore Lake Survey consists of 10 sample points located between the City of Chicago Jardine Water Purification Plant and Waukegan Harbor, Illinois. The ten sample points, numbered 1N through 11N (point 4N has been dropped), are located between 1 to 4 miles offshore (Figure 3).

Since all sewage treatment plant effluents along the north shore of Illinois have been diverted away from the lake, the main factors affecting water quality include creeks, boat harbors in the area and the remaining discharges along the north shore, consisting primarily of cooling water.

A summary of all chemical and microbiological analyses performed during 1980 is presented in Table 3.

Measured bacterial levels continued to remain low and well below the standard, indicating excellent water quality in this respect.

Fecal coliform geometric means were zero at all points except 5N, 6N and 7N which were calculated at 1, 1 and 2 per 100 ml, respectively. Only 10% of all the observations in 1980 had actual values for fecal coliform ranging from 1 to 18 per 100 ml. The remaining 90% of the observations were zero. These values were well below the Lake Michigan fecal coliform geometric mean standard of 20 per 100 ml. Fecal streptococci averages were zero at all points. Total coliform levels ranged from 0 to 56 per 100 ml with an all station arithmetic mean of 2.9/100 ml. Standard plate count averages were relatively low in 1980 but increased slightly from the previous year.

Ammonia nitrogen levels were below the water quality standard of 0.02 mg/l at all stations. Points 1N, 6N and 7N averaged 0.01 mg/l, with the remaining stations averaging less than 0.01 mg/l.

Figure 3. Locations of North Shore Lake Survey stations.

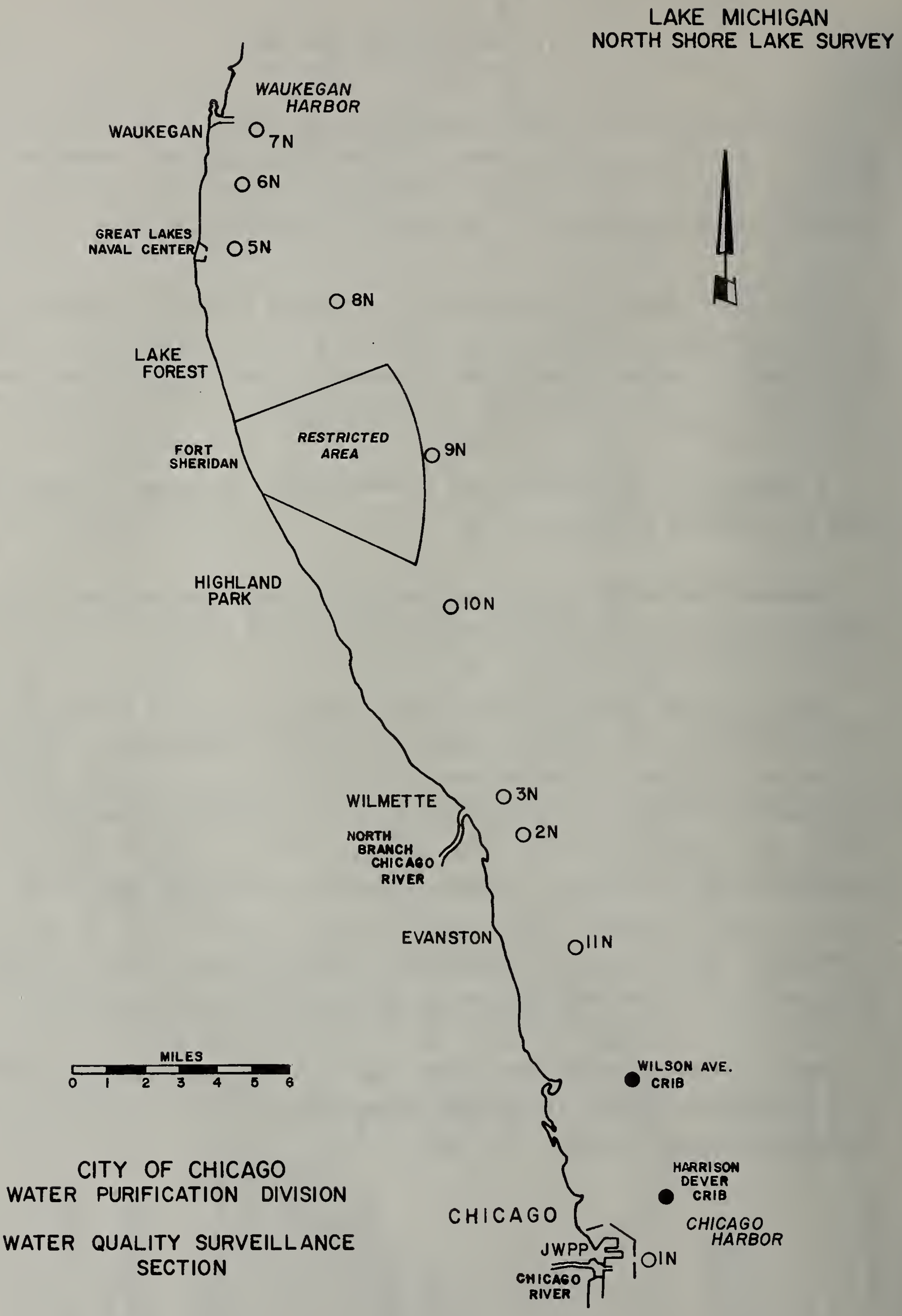


Table 3.

1980
NORTH SHORE LAKE SURVEY SUMMARY TABLE

PARAMETER		STORET NUMBER	SUR-VEYS	ANNUAL MEAN									
				1N	2N	3N	5N	6N	7N	8N	9N	10N	11N
TURBIDITY	T.U.	00076	8	2.08	1.57	1.39	1.64	2.31	2.67	1.09	1.26	1.06	1.34
ODOR, THRESHOLD	T.O.N.	00086	8	1.5	1.5	1.1	1.1	1.3	1.3	1.1	1.3	1.1	1.3
CONDUCTIVITY	µmhs	00095	8	291	288	288	289	290	291	283	285	288	287
OXYGEN DEMAND, CHEMICAL	mg/L	00335	8	7.9	7.9	8.4	3.3	7.4	7.1	6.5	6.6	8.3	7.8
pH		00400	8	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
RESIDUE, TOTAL NONFILTRABLE	mg/L	00530	8	11.1	8.6	3.8	7.9	6.8	9.0	5.5	5.0	5.0	7.4
NITROGEN, ORGANIC	mg/L	00605	8	0.19	0.19	0.17	0.14	0.21	0.18	0.16	0.14	0.15	0.18
NITROGEN, AMMONIA	mg/L	00610	8	0.01	< 0.01	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
NITROGEN, NITRITE-NITRATE	mg/L	00630	8	0.18	0.19	0.19	0.19	0.20	0.20	0.19	0.19	0.19	0.19
PHOSPHATE, TOTAL	mg/L	00650	8	0.056	0.049	0.044	0.034	0.048	0.039	0.028	0.039	0.026	0.039
PHOSPHATE, DISSOLVED	mg/L	00653	8	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01	< 0.01	0.01
CHLORIDE	mg/L	00940	8	8.3	8.0	8.0	9.3	9.4	8.5	8.3	7.8	7.9	8.0
SULFATE	mg/L	00945	8	21.3	21.6	21.6	20.6	21.1	20.5	22.8	21.9	22.8	21.6
PHENOL LIKE SUBSTANCES	µg/L	32730	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
PLATE COUNT, 48hr.-35°C	per mL	31753	8	415	282	85	85	65	77	55	56	54	49
COLIFORM, TOTAL	per 100 mL	31503	8	8	1	2	4	4	6	0	1	1	2
COLIFORM, FECAL	per 100 mL geo. mean	31616	8	0	0	0	1	1	2	0	0	0	0
STREP, FECAL	per 100 mL	31679	8	0	0	0	0	0	0	0	0	0	0
FUNGI	per mL	31856	8	1	0	0	1	1	1	0	1	0	1
ACTINOMYCETES	per mL	80148	8	1	0	1	2	1	1	1	1	0	0
PLANKTON	per mL	60050	8	668	548	905	773	600	623	590	498	405	720

City of Chicago Water Purification Division Water Quality Surveillance Section

Total phosphate levels ranged from <0.01 to 0.10 mg/l. The average total phosphate value for each of the North Shore stations exceeded the Lake Michigan water quality standard of 0.021 mg/l. All North Shore stations averaged 0.040 mg/l.

Chloride levels ranged from 6.2 to 11.8 mg/l, with an all station average of 8.4 mg/l. The water quality standard for chloride is 12.0 mg/l.

Sulfate levels ranged from 20.0 to 26.5 mg/l with an all station average of 21.6 mg/l, less than the standard of 24.0 mg/l.

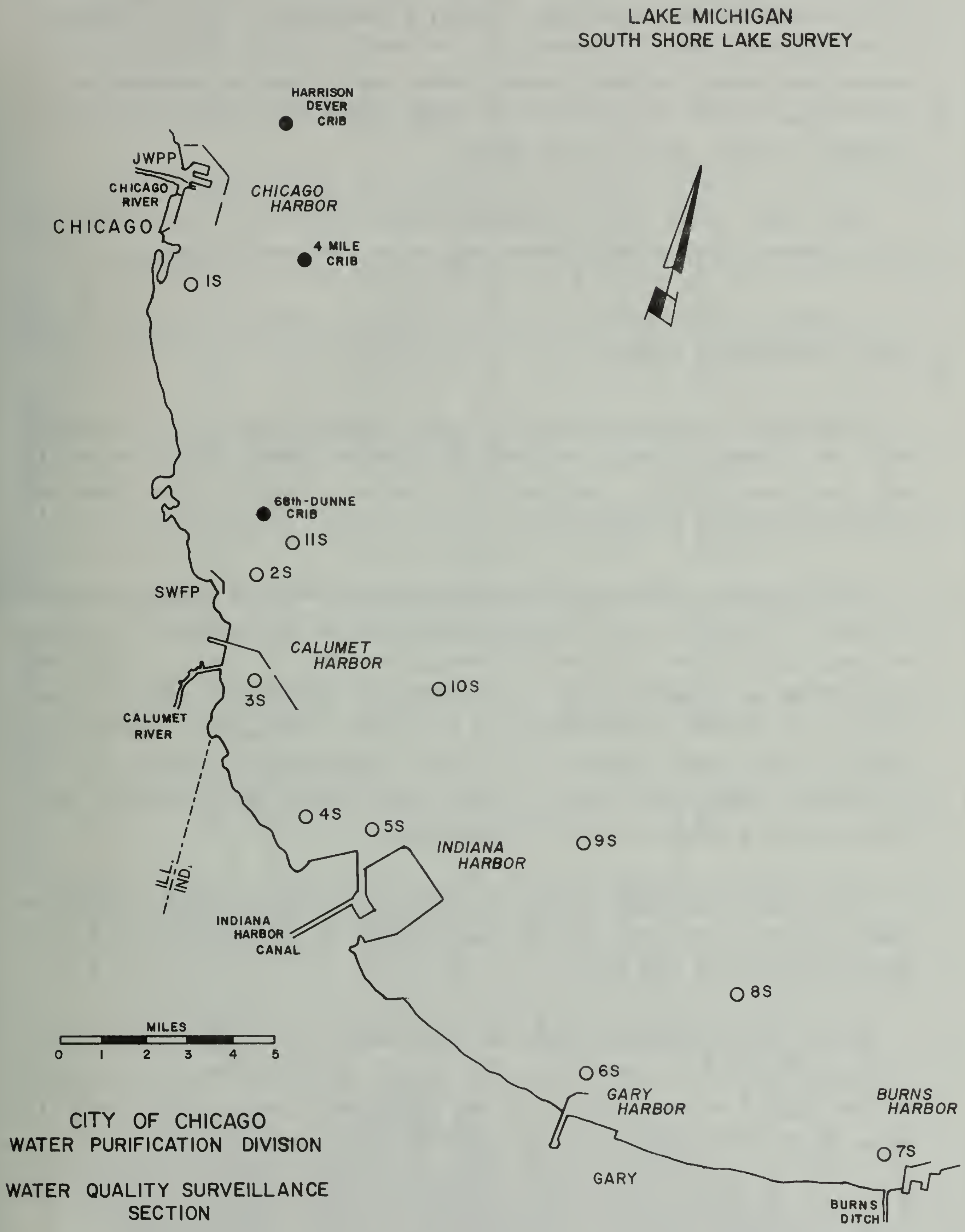
III. SOUTH SHORE LAKE SURVEY

The South Shore Lake Survey consists of 11 sample points numbered 1S through 11S between Chicago's Burnham Park Harbor and Burns Harbor, Indiana, just east of Gary. Points 1S through 7S are within one mile of shore and are strongly influenced by shore discharges. Points 8S through 11S are from two to six miles offshore and monitor the indirect effects of these discharges on the lake (Figure 4).

The shoreline which this survey covers includes about twenty miles of the most concentrated industrial area in the nation, consisting predominately of petroleum refining and steel manufacturing. The Indiana Harbor Canal, Calumet River and Burns Ditch are the recipients of large amounts of industrial waste and treated wastewater and are connected directly to the lake. They are the three primary sources affecting water quality along the south shore.

Since over 90% of the water in the Indiana Harbor Canal originates as treated wastewater, cooling water and storm water overflow from sewers, it is considered to be the main source of pollution in the southwestern basin of Lake Michigan. The effluents from steel mills, oil refineries and municipal sewage treatment plants often result in a plume which flows from the harbor, causing occasional periods of degraded raw water quality at Chicago's South Water Filtration Plant. This in turn requires additional water treatment for taste and odor control.

Figure 4. Locations of South Shore Lake Survey stations.



The Calumet River and the Grand Calumet River usually flow inland, but may flow into the lake during periods of heavy precipitation. Flow at the mouth of the Calumet River is lakeward due to nearby Indiana discharges. This outward flow carries polluted Calumet Harbor water into the southern tip of Lake Michigan which has neither the great depth nor the strong currents necessary to absorb and dilute the wastes.

Burns Ditch flows into Lake Michigan near Burns Harbor and drains the Little Calumet River, which receives large volumes of sewer discharges.

A summary of all chemical and microbiological analyses performed during 1980 is presented in Table 4.

The highest bacterial concentrations were observed at points 3S through 7S along the Calumet, Indiana, Gary and Burns Harbor areas. These continually high near shore points indicate the relative pollution load from the industrial complexes in this area.

Bacteriological analyses performed during 1980 indicated a slight increase in fecal coliform from 1979; however, total coliform averages nearly tripled. The South Shore Survey all station average in 1980 for total coliform was 1,198/100 ml as opposed to the 1979 average of 463/100 ml. Much of this increase in 1980 may be attributed to the alleged overloads to the Hammond, Indiana sanitary sewer system which occurred during periods of heavy rain in the summer. Apparently, sanitary wastes were flowing into the storm sewer system and being discharged into Lake Michigan.

Mean ammonia nitrogen values for 1980 were lower than 1979, although sample points 2S, 4S, 5S, 6S and 10S exceeded or were equal to the Lake Michigan standard of 0.02 mg/l.

Average total phosphate levels for 1980 ranged from 0.030 to 0.081 mg/l, an increase from 1979 values. Point 5S at the Indiana Harbor Canal entrance had the highest average level. All the South Shore Survey stations were in excess of the IPCB standard of 0.021 mg/l for total phosphate.

Table 4.

1980
SOUTH SHORE LAKE SURVEY SUMMARY TABLE

PARAMETER		STORET NUMBER	SUR-VEYS	ANNUAL MEAN										
				1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	11S
TURBIDITY	T.U.	00076	9	2.06	1.79	1.91	1.89	1.93	1.45	1.49	0.78	1.12	1.11	1.32
ODOR, THRESHOLD	T.O.N.	00086	9	1.6	1.6	1.6	1.8	1.3	1.2	1.6	1.1	1.3	1.1	1.1
CONDUCTIVITY	µmhos	00095	9	286	292	294	298	303	296	295	286	289	290	289
OXYGEN DEMAND, CHEMICAL	mg/L	00335	9	9.8	7.4	7.5	7.8	8.3	7.3	6.8	7.7	7.3	8.1	7.8
pH		00400	9	8.4	8.4	8.4	8.4	8.3	8.4	8.4	8.4	8.4	8.4	8.4
RESIDUE, TOTAL NONFILTRABLE	mg/L	00530	9	8.3	4.9	6.1	5.6	9.7	5.3	3.1	6.3	4.4	5.0	7.1
NITROGEN, ORGNIC	mg/L	00605	9	0.18	0.18	0.17	0.18	0.18	0.18	0.17	0.16	0.16	0.16	0.16
NITROGEN, AMMONIA	mg/L	00610	9	< 0.01	0.02	<0.01	0.05	0.06	0.02	<0.01	<0.01	< 0.01	0.02	0.01
NITROGEN, NITRITE-NITRATE	mg/L	00630	9	0.19	0.18	0.20	0.21	0.22	0.20	0.20	0.19	0.19	0.19	0.19
PHOSPHATE, TOTAL	mg/L	00650	9	0.043	0.063	0.058	0.062	0.081	0.049	0.043	0.030	0.030	0.036	0.050
PHOSPHATE, DISSOLVED	mg/L	00653	9	0.01	0.01	0.02	0.02	0.01	0.02	0.01	<0.01	<0.01	< 0.01	0.01
CHLORIDE	mg/L	00940	9	8.6	8.9	9.3	10.0	11.1	9.4	9.4	8.7	8.8	8.8	8.7
SULFATE	mg/L	00945	9	21.4	21.6	21.9	22.2	23.3	21.8	22.9	21.5	21.8	22.0	21.7
PHENOL LIKE SUBSTANCES	µg/L	32730	9	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT, 48hr.-35°C	per mL	31753	9	260	380	6,631	1,560	12,870	903	1,578	238	95	640	585
COLIFORM, TOTAL	per 100 mL	31503	9	3	67	7,398	1,351	3,660	68	52	5	17	22	19
COLIFORM, FECAL	per 100 mL geo. mean	31616	9	1	3	10	14	39	5	2	1	2	2	1
STREP, FECAL	per 100 mL	31679	9	0	1	4	1	3	0	0	0	0	0	0
FUNGI	per mL	31856	9	1.9	1.4	0.3	0.6	0.6	0.5	1.3	0.1	0.1	1.3	1.9
ACTINOMYCETES	per mL	80148	9	0.5	0.1	1.4	1.4	0.4	0.0	0.9	0.1	0.4	0.4	0.8
PLANKTON	per mL	60050	9	646	811	598	742	673	480	425	398	488	580	569

City of Chicago — Water Purification Division — Water Quality Surveillance Section

Average chloride levels were down slightly from 1979 and were within the standard of 12.0 mg/l at all sample points.

Average sulfate levels ranged from 21.4 to 23.3 mg/l, all below the standard of 24.0 mg/l. These levels were less than those recorded for 1979.

Based on chemical and microbiological data from sample point 5S, the Indiana Harbor Canal delivers the highest pollution load to Lake Michigan in the southwestern basin. Point 5S had the highest average values of all sample stations during 1980 for fecal coliform, ammonia nitrogen, total phosphate, chloride and sulfate. These averages considerably exceeded the IPCB Lake Michigan water quality standards for all these parameters except sulfate.

IV. JARDINE WATER PURIFICATION PLANT RADIAL LAKE SURVEY

The JWPP Radial Lake Survey consists of 23 sample points located along 5 radii projecting from an axis point at the Jardine Water Purification Plant (Figure 5). This survey is intended to assess the water quality within a ten mile radius of the Jardine Water Purification Plant.

There were four JWPP Radial Surveys performed in 1980 as compared to two surveys performed in 1979. Bacterial levels indicated water of good quality; however, the average concentration increased from 1979. Average total coliform values ranged from 1 to 24 per 100 ml, with seven stations recording values of zero. The increase in 1980 is attributed to sample point 5D which on the April 8, 1980 survey exhibited unusually high contamination with greater than normal levels for total coliform, fecal coliform, and standard plate count.

There was relatively little change in total phosphate levels between 1979 and 1980. Average total phosphate levels for the four surveys ranged from 0.01 to 0.06 mg/l, with an all station average of 0.05 mg/l. The Lake Michigan standard for total phosphate is 0.021 mg/l.

Average ammonia nitrogen levels for the four surveys ranged from <0.01 to 0.03 mg/l. An all station average of 0.01 mg/l was within the standard of 0.02 mg/l.

Figure 5. Locations of Jardine Water Purification Plant Radial Survey stations.

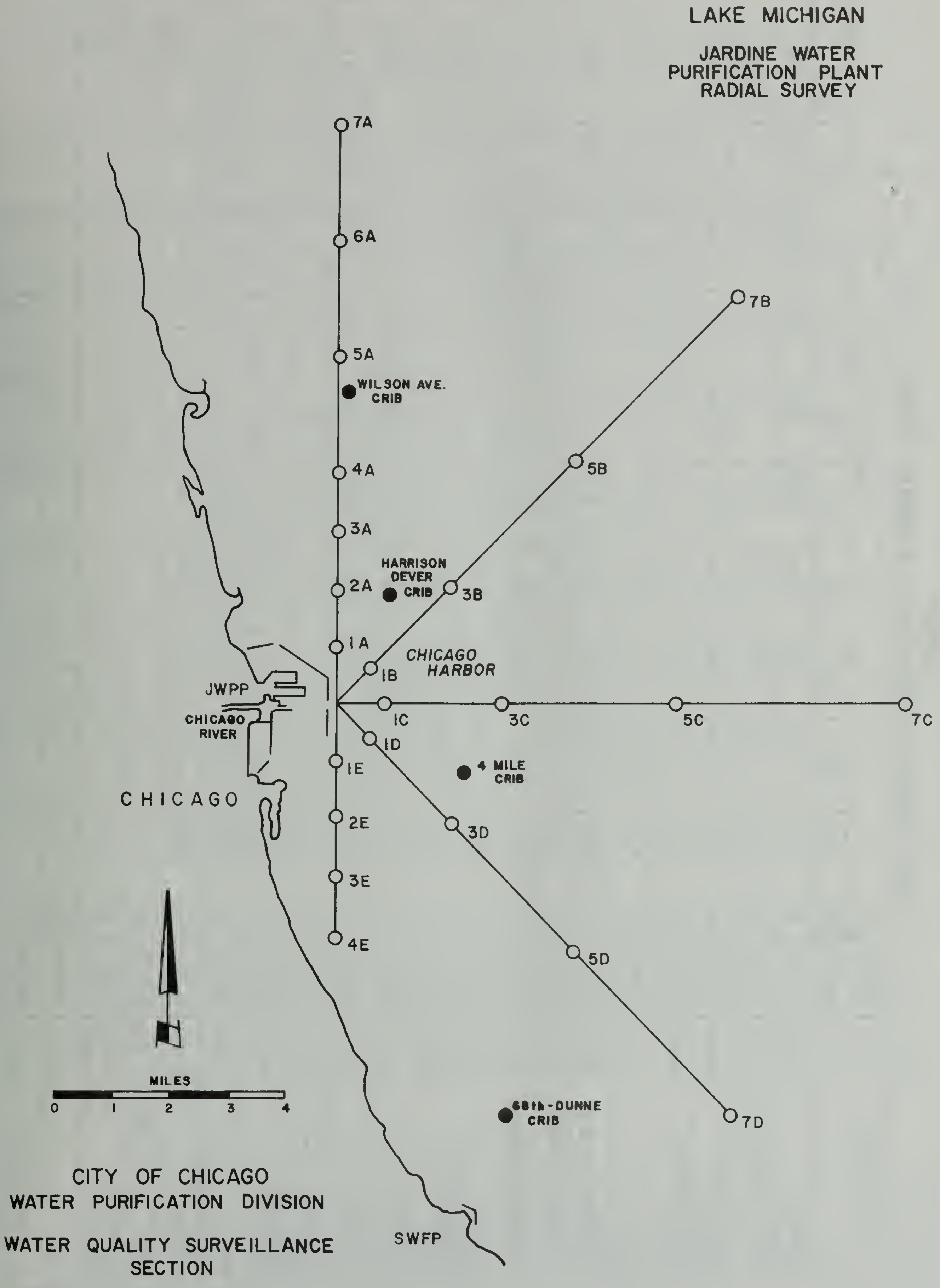


Table 5.

1980
JWPP RADIAL LAKE SURVEY SUMMARY TABLE

PARAMETER	STORET NUMBER	SURV-EYS	ANNUAL MEAN										
			1 A	2 A	3 A	4 A	5 A	6 A	7 A	1B	3 B	5 B	7 B
TURBIDITY T.U.	00076	4	1.78	1.70	1.26	1.04	1.39	0.95	1.08	0.78	0.65	0.68	0.51
ODOR, THRESHOLD T.O.N.	00086	4	1.50	1.00	1.00	1.00	1.00	1.25	1.25	1.25	1.00	1.00	1.00
CONDUCTIVITY μmhos	00095	4	291	289	288	288	290	286	288	285	285	285	283
OXYGEN DEMAND, CHEMICAL mg/L	00335	4	8.0	8.2	8.2	10.5	7.0	7.5	8.5	8.0	15.7	9.2	7.5
pH	00400	4	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
RESIDUE, TOTAL NONFILTRABLE mg/L	00530	4	8.75	6.50	4.50	2.25	3.25	7.50	6.25	4.50	7.00	6.25	7.50
NITROGEN, ORGANIC mg/L	00605	4	0.16	0.16	0.14	0.16	0.18	0.17	0.18	0.16	0.15	0.14	0.13
NITROGEN, AMMONIA mg/L	00610	4	< 0.01	< 0.01	<0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	< 0.01
NITROGEN, NITRITE-NITRATE mg/L	00630	4	0.19	0.19	0.18	0.19	0.20	0.19	0.19	0.19	0.19	0.19	0.18
PHOSPHATE, TOTAL mg/L	00650	4	0.05	0.03	0.04	0.04	0.05	0.05	0.04	0.03	0.04	0.04	0.04
PHOSPHATE, DISSOLVED mg/L	00653	4	0.02	0.01	<0.01	0.01	0.01	< 0.01	< 0.01	<0.01	<0.01	0.02	0.01
CHLORIDE mg/L	00940	4	9.40	9.03	8.48	8.60	8.50	8.45	8.33	8.45	8.45	8.15	8.08
SULFATE mg/L	00945	4	21.4	21.1	21.1	21.0	21.1	21.1	20.8	21.1	21.9	21.5	21.5
PHENOL LIKE SUBSTANCES μg/L	32730	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
IRON μg/L	01045	4	43.5	45.0	29.5	22.3	34.5	25.5	42.8	32.5	20.8	22.0	23.8
PLATE COUNT, 48hr.-35°C per mL	31753	4	166	27	93	100	47	74	115	105	95	103	79
COLIFORM, TOTAL per 100 mL	31503	4	4	4	1	1	0	0	2	0	1	0	0
COLIFORM, FECAL per 100 mL geo. mean	31616	4	1	1	0	0	0	0	0	0	0	0	0
FUNGI per mL	31856	4	0	1	1	0	1	0	1	0	0	0	0
ACTINOMYCETES per mL	80148	4	1	1	0	1	2	1	2	1	1	3	0
PLANKTON per mL	60050	4	270	640	495	370	740	240	420	1,225	425	250	525

City of Chicago Water Purification Division Water Quality Surveillance Section

Table 5 (continued).

1980
JWPP RADIAL LAKE SURVEY SUMMARY TABLE (cont'd.)

PARAMETER		STORET NUMBER	SURV-EYS	ANNUAL MEAN											
				1 C	3 C	5 C	7 C	1 D	3 D	5 D	7 D	1 E	2 E	3 E	4 E
TURBIDITY	T.U.	00076	4	1.09	0.84	0.61	0.49	1.31	0.86	1.24	0.53	2.00	1.04	1.74	1.70
ODOR, THRESHOLD	T.O.N.	00086	4	1.25	1.50	1.00	1.00	1.25	1.00	1.50	1.00	1.00	1.00	1.25	1.00
CONDUCTIVITY	µmhos	00095	4	286	284	284	284	288	285	289	286	291	289	291	290
OXYGEN DEMAND, CHEMICAL	mg/L	00335	4	9.45	7.95	7.70	7.23	8.45	6.95	7.93	9.98	6.48	9.23	7.20	7.98
pH		00400	4	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
RESIDUE, TOTAL NONFILTRABLE	mg/L	00530	4	6.50	8.25	5.75	4.50	15.50	6.00	10.00	4.00	7.50	3.75	8.00	5.75
NITROGEN, ORGANIC	mg/L	00605	4	0.15	0.14	0.16	0.13	0.13	0.14	0.14	0.13	0.14	0.15	0.14	0.20
NITROGEN, AMMONIA	mg/L	00610	4	< 0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	< 0.01	0.01	0.02	0.02	0.03
NITROGEN, NITRITE-NITRATE	mg/L	00630	4	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.18	0.19	0.18	0.19	0.19
PHOSPHATE, TOTAL	mg/L	00650	4	0.04	0.05	0.06	0.05	0.10	0.04	0.03	0.01	0.04	0.06	0.04	0.05
PHOSPHATE, DISSOLVED	mg/L	00653	4	< 0.01	0.02	0.03	0.02	0.08	0.02	0.01	<0.01	<0.01	0.01	<0.01	< 0.01
CHLORIDE	mg/L	00940	4	8.48	8.45	8.30	8.03	8.48	8.35	8.50	8.10	8.80	8.30	9.05	8.55
SULFATE	mg/L	00945	4	22.0	21.3	21.6	21.0	22.1	22.0	22.1	22.3	23.1	21.7	22.3	22.2
PHENOL LIKE SUBSTANCES	µg/L	32730	4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
IRON	µg/L	01045	4	40.5	17.3	27.8	16.5	29.5	25.3	32.5	27.5	51.8	46.0	26.5	35.8
PLATE COUNT 48 hr.-35°C	per mL	31753	4	67	26	20	23	24	21	143	16	13	11	71	26
COLIFORM, TOTAL	per 100 mL	31503	4	3	1	0	1	4	1	24	0	4	4	3	3
COLIFORM, FECAL	per mL geo. mean	31616	4	0	0	0	0	0	0	2	0	0	0	0	0
FUNGI	per mL	31856	4	0	0	0	0	1	0	0	0	1	0	0	0
ACTINOMYCETES	per mL	80148	4	1	1	0	0	1	1	0	0	1	1	2	0
PLANKTON	per mL	60050	4	470	470	205	490	370	345	165	40,667	490	460	510	200

City of Chicago Water Purification Division Water Quality Surveillance Section

Mean chloride levels ranged from 8.0 to 9.4 mg/l. The IPCB standard for chloride is 12.0 mg/l.

Sulfate averages ranged from 20.8 to 23.1 mg/l, all within the standard of 24.0 mg/l.

A summary of all chemical and microbiological analyses performed during 1980 is presented in Table 5.

V. SOUTH WATER FILTRATION PLANT RADIAL LAKE SURVEY

The SWFP Radial Lake Survey consists of 22 sample points located along 5 radii projecting out from an axis point near the South Water Filtration Plant (Figure 6). The purpose of this survey is to assess the water quality within a 10 mile radius of the South Water Filtration Plant.

Water quality within the survey vicinity is largely determined by the action of the discharges from the Calumet-Indiana Harbor industrial area. Meteorological conditions determine to what extent the Indiana Harbor Canal and other shore discharges will flow into the survey area. Radius "J" exhibited higher average bacterial levels than the other radii due to the close proximity of these discharges. Chemical levels were not significantly affected.

Total phosphate averages ranged from 0.04 to 0.07 mg/l with an all station survey average of 0.05 mg/l, all in excess of the 0.021 mg/l standard.

Chloride and sulfate levels remained well within the Lake Michigan standards of 12.0 and 24.0 mg/l, respectively.

A summary of all chemical and microbiological analyses performed during 1980 is presented in Table 6.

Figure 6. Location of South Water Purification Plant Radial Survey stations.

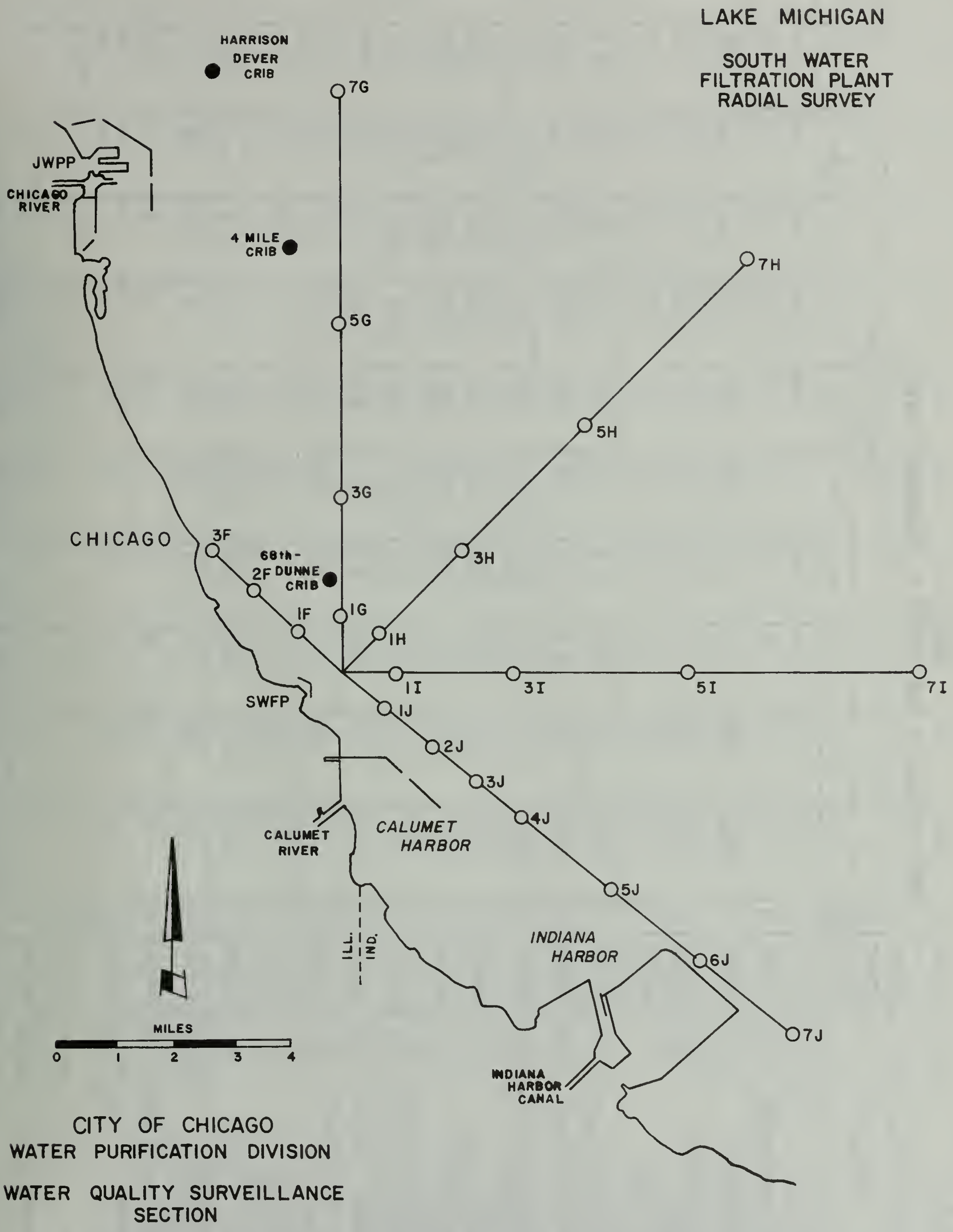


Table 6.

1980
SWFP RADIAL LAKE SURVEY SUMMARY TABLE

PARAMETER	STORET NUMBER	SURV-EYS	ANNUAL MEAN										
			1F	2F	3F	1G	3G	5G	7G	1H	3H	5H	7H
TURBIDITY T.U.	00076	4	1.84	1.85	2.60	1.68	1.46	0.88	0.78	1.00	1.38	1.17	0.73
ODOR, THRESHOLD T.O.N.	00086	4	1.5	1.3	1.3	1.7	1.0	1.0	1.3	1.3	1.0	1.0	1.0
CONDUCTIVITY µmhos	00095	4	290	290	290	291	290	290	291	291	289	285	282
OXYGEN DEMAND, CHEMICAL mg/L	00335	4	8.2	7.2	9.1	6.5	7.2	8.9	6.8	7.7	7.5	7.8	6.8
pH	00400	4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
RESIDUE, TOTAL NONFILTRABLE mg/L	00530	4	15.8	8.3	10.3	13.8	5.5	11.0	4.0	9.3	9.5	5.3	14.7
NITROGEN, ORGANIC mg/L	00605	4	0.16	0.16	0.16	0.15	0.14	0.14	0.15	0.14	0.14	0.09	0.13
NITROGEN, AMMONIA mg/L	00610	4	< 0.01	0.01	0.01	0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
NITROGEN, NITRITE-NITRATE mg/L	00630	4	0.21	0.21	0.21	0.20	0.19	0.19	0.18	0.21	0.20	0.19	0.18
PHOSPHATE, TOTAL mg/L	00650	4	0.05	0.06	0.07	0.06	0.05	0.04	0.06	0.06	0.05	0.06	0.06
PHOSPHATE, DISSOLVED mg/L	00653	4	0.01	< 0.01	0.01	0.02	< 0.01	0.02	< 0.01	< 0.01	0.02	0.01	< 0.01
CHLORIDE mg/L	00940	4	9.8	9.7	9.5	9.5	9.1	8.7	8.7	9.4	8.9	8.5	8.3
SULFATE mg/L	00945	4	21.7	21.8	21.5	21.1	21.3	21.3	21.0	22.1	21.5	21.9	22.2
PHENOL LIKE SUBSTANCES µg/L	32730	4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
IRON µg/L	01045	4	42.0	36.5	33.8	20.3	23.5	15.0	9.0	32.3	16.5	20.0	15.0
PLATE COUNT 48 hr. - 35°C per mL	31753	4	41	28	21	34	24	20	8	105	155	2	7
COLIFORM, TOTAL per 100 mL	31503	4	3	3	6	2	1	0	0	3	2	0	0
COLIFORM FECAL per 100 mL geo. mean	31616	4	2	0	2	0	0	1	0	1	2	0	0
FUNGI per mL	31856	4	0	1	1	1	0	0	0	1	1	1	0
ACTINOMYCETES per mL	80148	4	1	0	1	1	0	0	0	1	1	0	0
PLANKTON mL	60050	4	726	1,550	980	760	730	420	693	405	325	673	153

Table 6 (continued).

1980
SWFP RADIAL LAKE SURVEY SUMMARY TABLE (cont'd.)

PARAMETER	STORET NUMBER	SURV-EYS	ANNUAL MEAN										
			1I	3I	5I	7I	1J	2J	3J	4J	5J	6J	7J
TURBIDITY T.U.	00076	4	0.81	1.58	1.14	0.75	1.35	2.03	1.78	2.08	1.50	1.35	1.31
ODOR, THRESHOLD T.O.N.	00086	4	1.3	1.0	1.0	1.0	1.5	1.0	1.3	1.0	1.3	1.0	1.3
CONDUCTIVITY µmhos	00095	4	286	289	283	285	289	290	293	288	294	293	294
OXYGEN DEMAND, CHEMICAL mg/L	00335	4	9.4	8.2	9.6	8.0	11.4	9.3	7.0	8.3	8.2	8.2	8.4
pH	00400	4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
RESIDUE, TOTAL NONFILTRABLE mg/L	00530	4	2.8	2.8	6.3	5.5	14.5	5.3	6.5	9.3	4.3	4.3	6.0
NITROGEN, ORGANIC mg/L	00605	4	0.17	0.16	0.16	0.14	0.17	0.16	0.17	0.19	0.19	0.16	0.16
NITROGEN, AMMONIA mg/L	00610	4	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	<0.01	0.01	< 0.01
NITROGEN, NITRITE-NITRATE mg/L	00630	4	0.22	0.21	0.19	0.20	0.22	0.21	0.21	0.21	0.21	0.22	0.23
PHOSPHATE, TOTAL mg/L	00650	4	0.05	0.04	0.05	0.07	0.05	0.04	0.04	0.05	0.04	0.06	0.06
PHOSPHATE, DISSOLVED mg/L	00653	4	< 0.01	< 0.01	0.01	0.01	0.01	0.01	< 0.01	<0.01	< 0.01	0.01	< 0.01
CHLORIDE mg/L	00940	4	9.1	9.1	8.7	8.6	9.2	9.0	8.8	9.2	9.1	9.2	9.6
SULFATE mg/L	00945	4	22.0	21.4	21.5	21.4	21.6	20.9	21.8	21.1	21.9	22.6	22.8
PHENOL LIKE SUBSTANCES µg/L	32730	4	< 1	< 1	<1	< 1	< 1	<1	<1	< 1	< 1	< 1	<1
IRON µg/L	01045	4	33.3	33.5	16.8	14.3	41.8	36.3	42.0	40.0	34.5	34.8	35.0
PLATE COUNT 48 hr. - 35°C per mL	31753	4	133	129	37	19	229	138	503	574	111	465	77
COLIFORM, TOTAL per 100 mL	31503	4	1	1	2	0	9	5	35	5	8	39	3
COLIFORM, FECAL per 100 mL geo. mean	31616	4	0	2	0	0	0	1	5	3	1	3	0
FUNGI per mL	31856	4	1	1	0	1	0	0	1	1	0	0	1
ACTINOMYCETES per mL	80148	4	1	0	1	0	1	0	1	2	0	1	0
PLANKTON per mL	60050	4	620	815	615	305	680	1,120	755	540	1,005	1,180	913

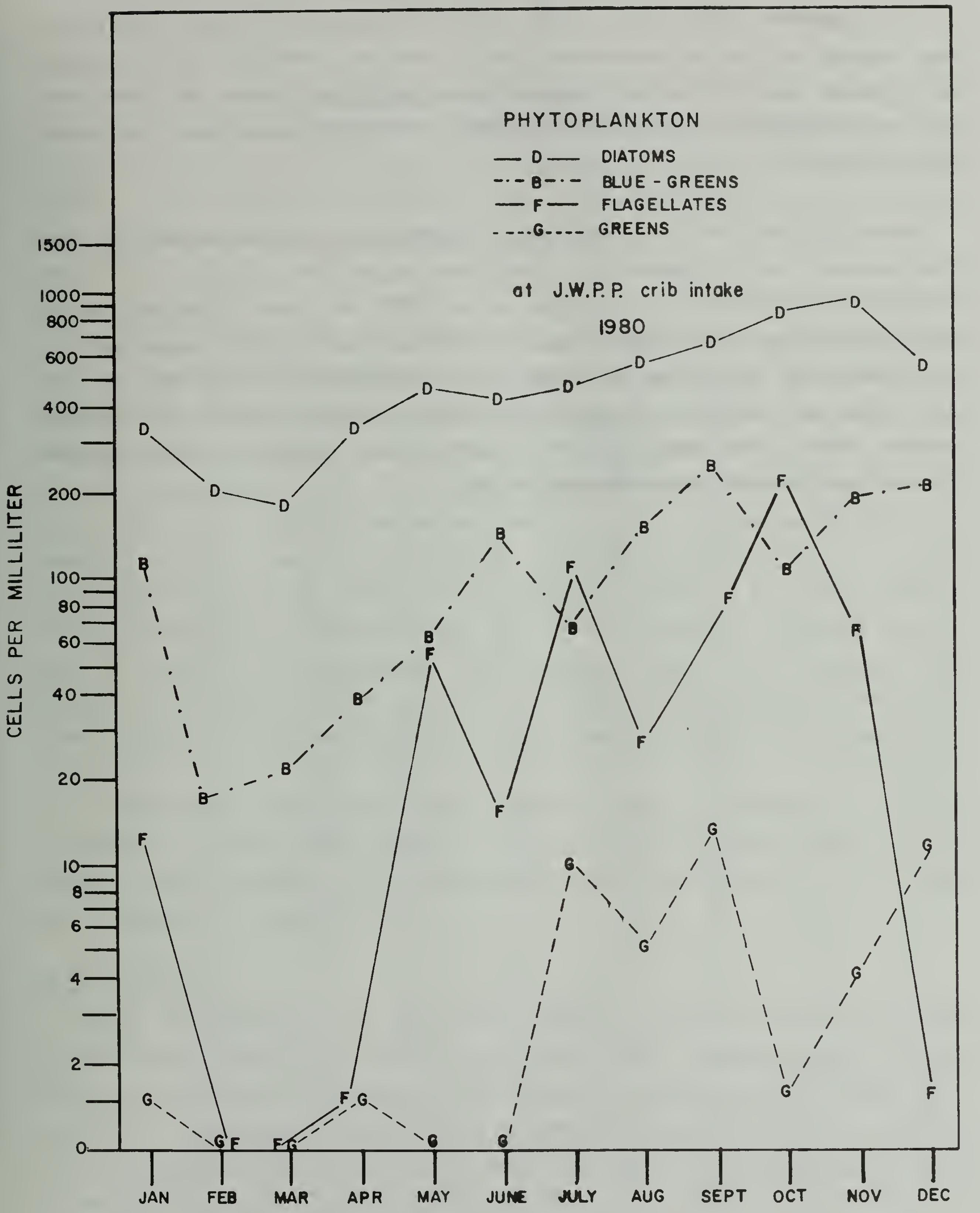
VI. PHYTOPLANKTON MONTHLY VARIATION, 1980

For evaluation purposes, the phytoplankton were divided into four general groups: diatoms, blue-green algae, pigmented flagellates, and green algae. A monthly summary of phytoplankton data collected from the JWPP crib intake during the calendar year of 1980 is presented in Figure 7. Phytoplankton composition varies qualitatively and quantitatively from lake to lake and seasonally within any given body of water. These variations are dependant upon a number of environmental factors, including light, temperature, dissolved solids (particularly those dissolved solids or nutrients necessary for phytoplankton production) and upon biological features such as population adaptabilities and competition.

Lake Michigan lies in a temperate region of the world producing various assemblages of phytoplankton. One of these are diatoms, the most abundant algae of Lake Michigan (Tarapchak and Stoermer, 1976). They utilize silica, rather than cellulose, as a major component in their cell wall. Seasonal blooms or pulses in diatom populations may occur, usually as two conspicuous blooms, one in early spring and another in autumn. Sometimes three or more blooms per year are common. Again it must be stressed that the correlation for these pulses in population are dependant upon many factors and are not fully understood. The 1980 seasonal variation for diatoms was typical for Lake Michigan. Diatoms continued to dominate in numbers over the other phytoplankton groups. Seasonal variations exhibited a population pulse in the spring, a gradual increase through the summer to a second peak in autumn of approximately 900 cells per ml, followed by a decline in December.

Another phytoplankton assemblage is the blue-green algae. In large lakes, blue-green algae typically exhibit a spring pulse and a late summer pulse. This was indeed the case in Lake Michigan during 1980, with a gradually increasing population throughout the year.

Figure 7. Monthly summary of phytoplankton data collected at the crib intake of the Jardine Water Purification Plant.



The pigmented flagellates, along with the blue-green algae, constitute a large segment of the phytoplankton. One of the most abundant filter clogging and potential odor producing flagellates is Dinobryon. Pulses of flagellated algae were recorded in the spring and summer, with a maximum peak in autumn of 200 cells per ml.

Green algae may occur in small-scale blooms during the summer months, some simultaneously with blooms of blue-green algae and diatoms. For the southwestern portion of Lake Michigan during 1980, the green algae occurred in low concentrations with counts for all months of less than 20 cells per ml. For seven months out of the year, the green algae monthly average was equal to zero or one cell per ml. The only substantial increase was from July through December with a maximum of 13 cells per ml in September. Some downward fluctuations occurred in August and October.

SECTION B

WATER QUALITY TREND ANALYSIS

Lake survey data for 1980 have been summarized for the North Shore, South Shore and Open Water Surveys in order to provide a continuation of the ten-year trend analysis as reported in previous Lake Michigan Water Quality Reports. The parameters evaluated were: total coliform, fecal coliform, total phosphate, ammonia nitrogen and phytoplankton.

Total Coliform

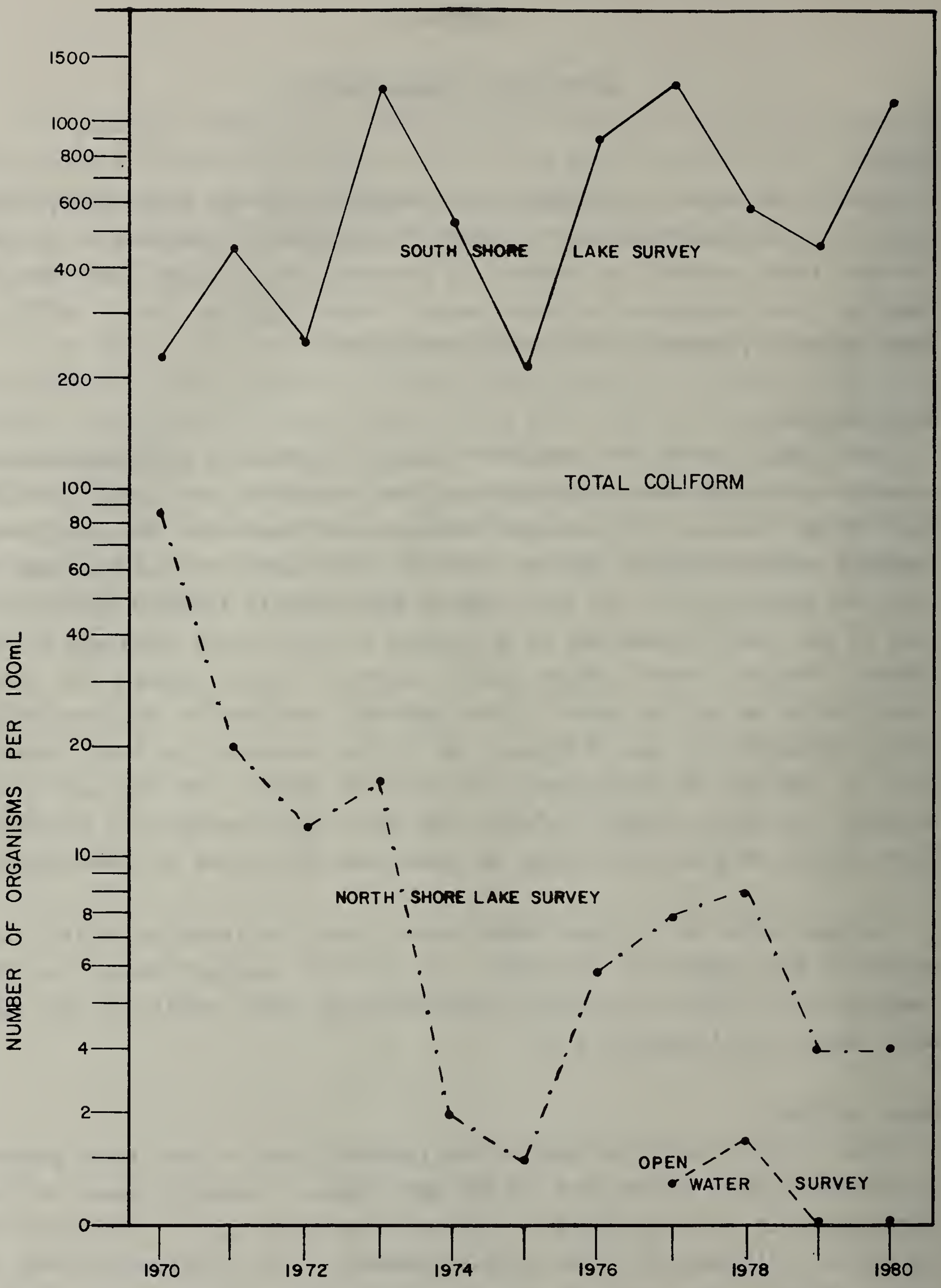
The results for the last ten survey seasons indicate a continued downward trend for the North Shore with total coliform concentrations in 1979 and 1980 at 3/100 ml. However, the average total coliform levels for the South Shore indicate an upward trend. Average levels in 1980 nearly tripled from that of 1979 and approached the ten year high of approximately 1300/100 ml in 1977. Much of the 1980 increase may be attributed to the alleged overloads to the Hammond sanitary sewer system which occurred during periods of heavy precipitation during the summer. This apparently resulted in sanitary wastes being discharged into Lake Michigan. Due to this incident, the total coliform data in 1980 may be incongruous with previous years. The ten-year trend analyses for total coliform indicate the South Shore averages to be ninety times greater than the North Shore, an appreciable difference in concentration.

Average levels for the Open Water Survey, since its inception in 1977, are presented for comparative purposes. As in 1979, average levels in 1980 remained zero, indicating excellent bacteriological water quality for the Open Water Survey area (Figures 8 & 9).

Fecal Coliform

Fecal coliform geometric mean values remained three to four times greater for the South Shore Survey than for the North Shore. Geometric means for the North and South Shore Surveys were well below the water quality standard of 20 per 100 ml. Although the fecal coliform geometric mean increased in 1980, it varied slightly from those of the past ten years. The Open Water Survey geometric means remain zero (Figures 10 & 11).

Figure 8. Total coliform trends in Lake Michigan, 1970-1980.



WATER QUALITY SURVEILLANCE SECTION

Figure 9. Average and maximum concentrations of total coliform, 1971-1980.

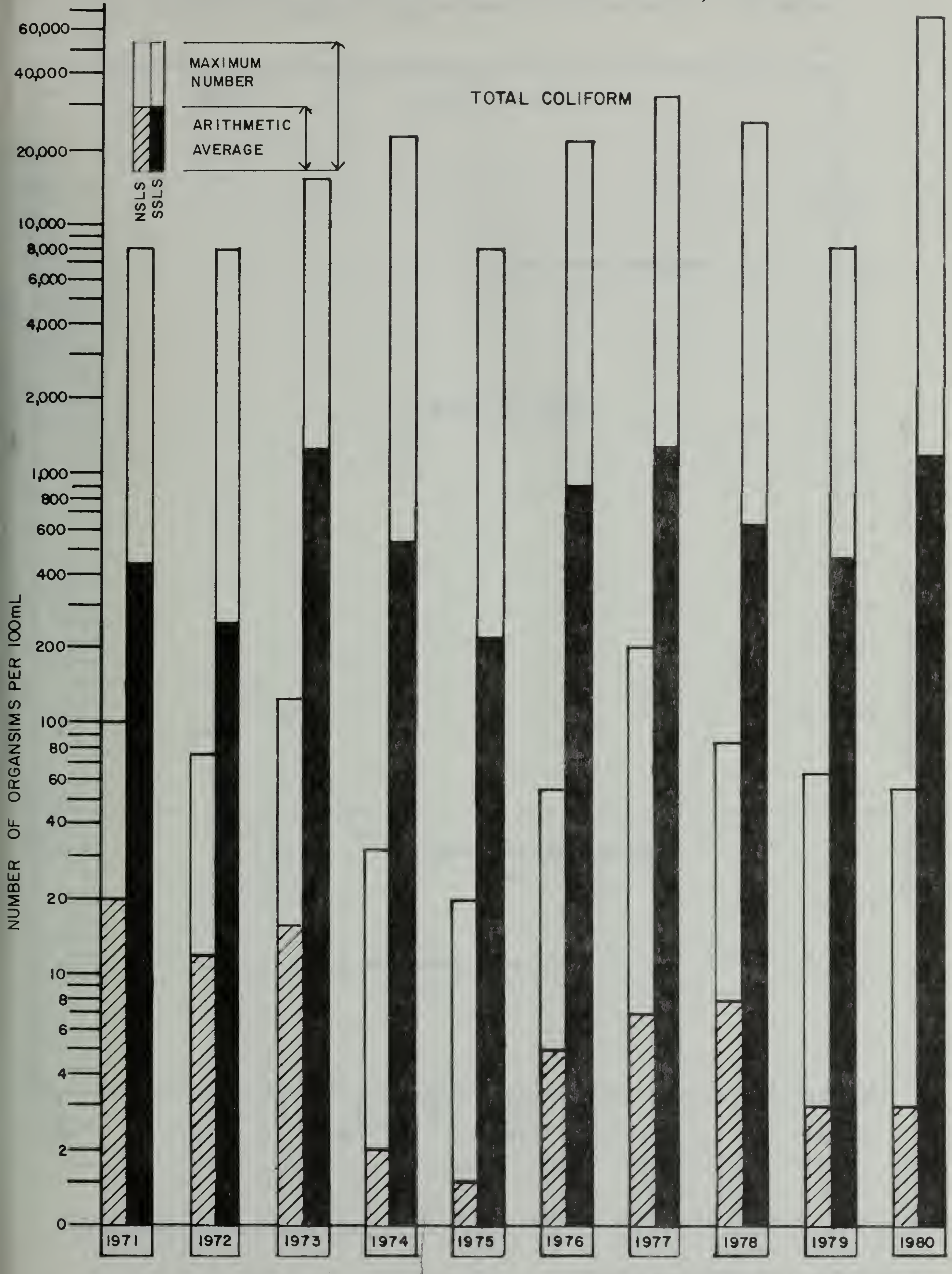


Figure 10. Fecal coliform trends in Lake Michigan, 1970-1980.

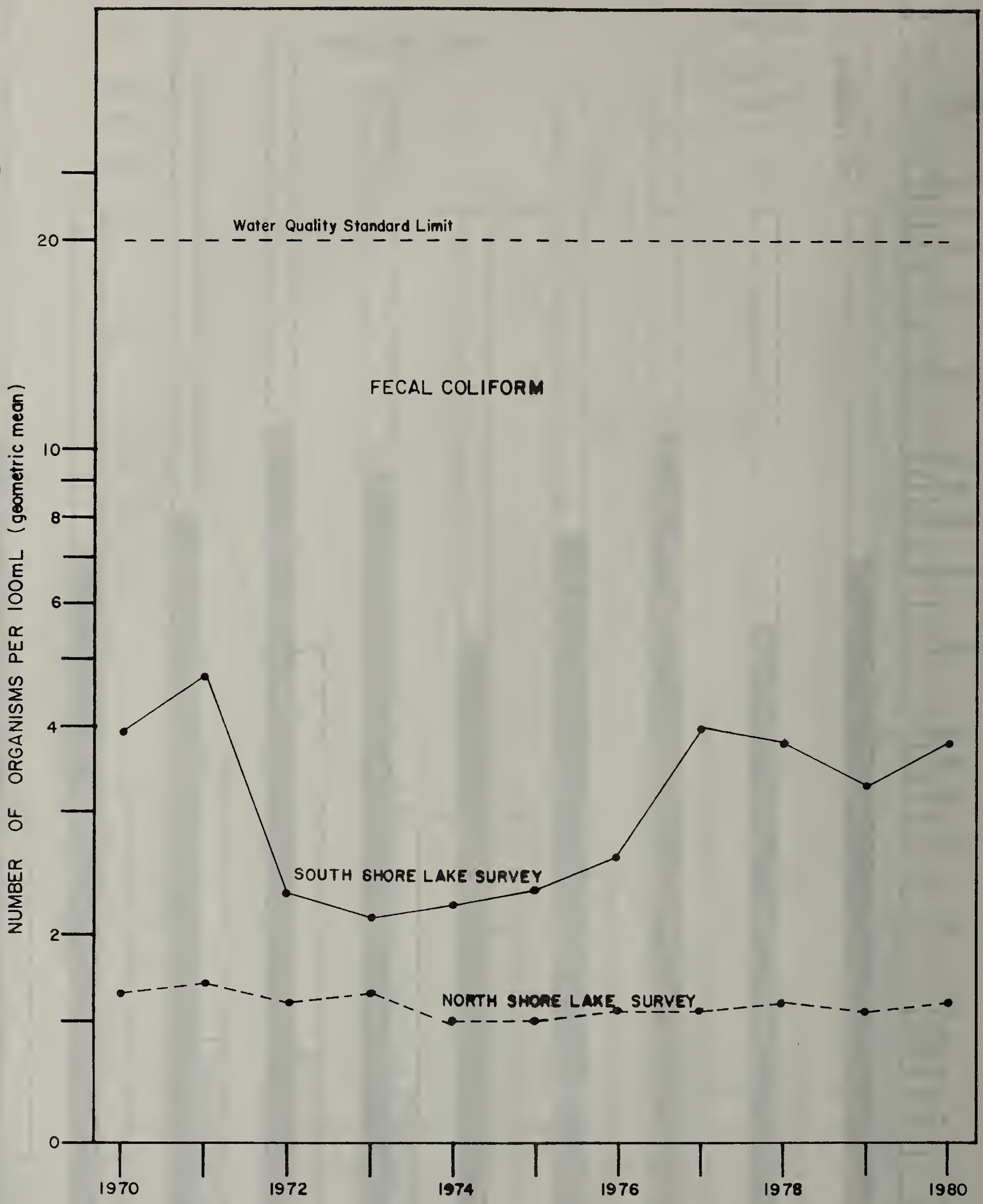
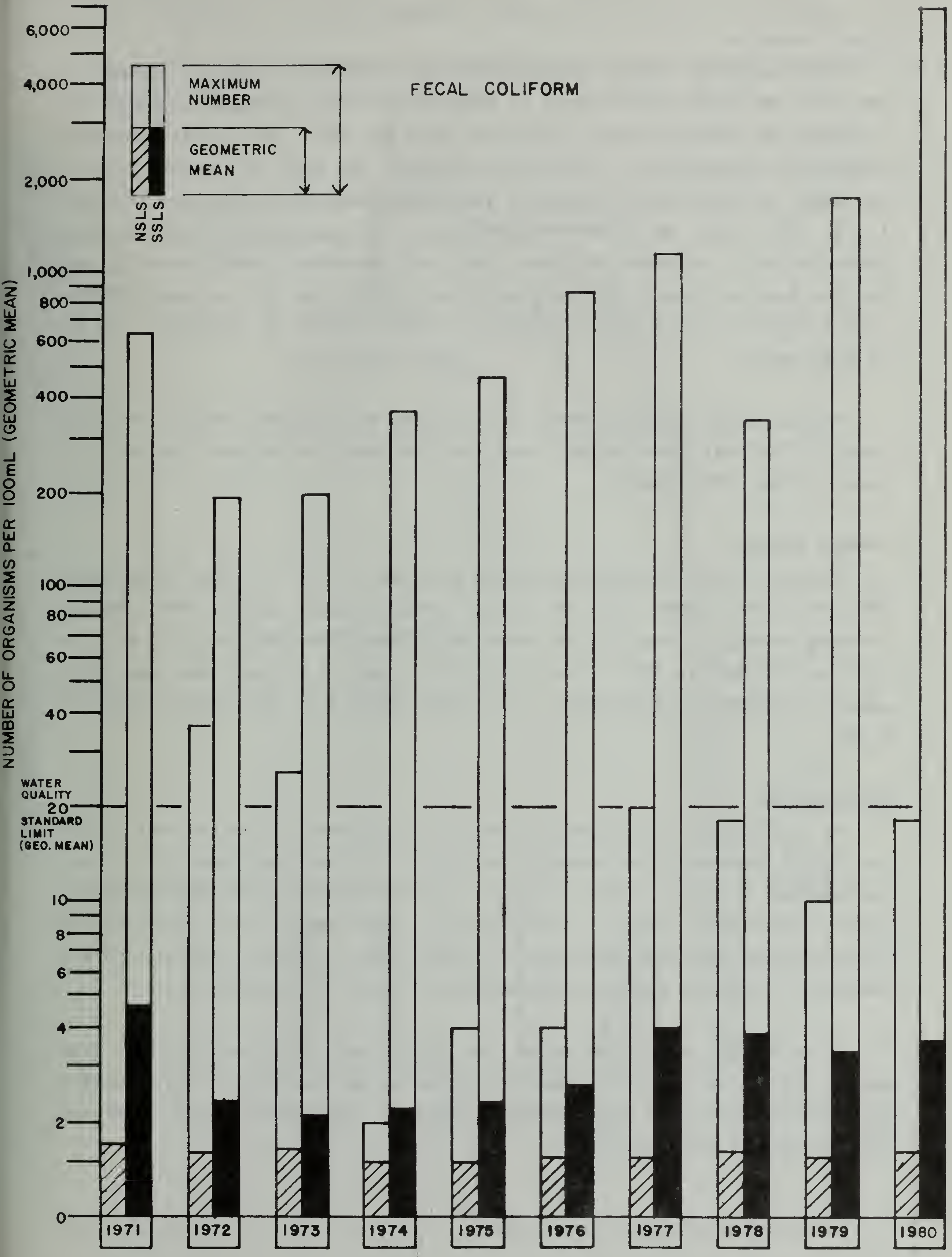


Figure 11. Geometric mean and maximum concentrations of fecal coliform, 1971-1980.



Total Phosphate

Total phosphate average concentrations for 1980 were slightly elevated for the North and South Shore Surveys as compared with 1979 averages, although the increases in 1980 were not as great as those in 1979. With total phosphate apparently increasing at a slower rate and with the rate of increase between the North and South Shore Surveys in 1980 being somewhat proportional (Figures 12 & 13), this may be an indication of approaching more uniform concentrations. Whatever the trend, the total phosphate levels presently and for the past ten years, with the exception of 1978, are all in excess of the IPCB standard of 0.021 mg/l (equivalent to the standard for phosphorus, as P, of 0.007 mg/l).

Average total phosphate levels for the Open Water Survey, while lower than those of the North Shore Survey, have also increased for the past two years in excess of the IPCB standard.

Ammonia Nitrogen

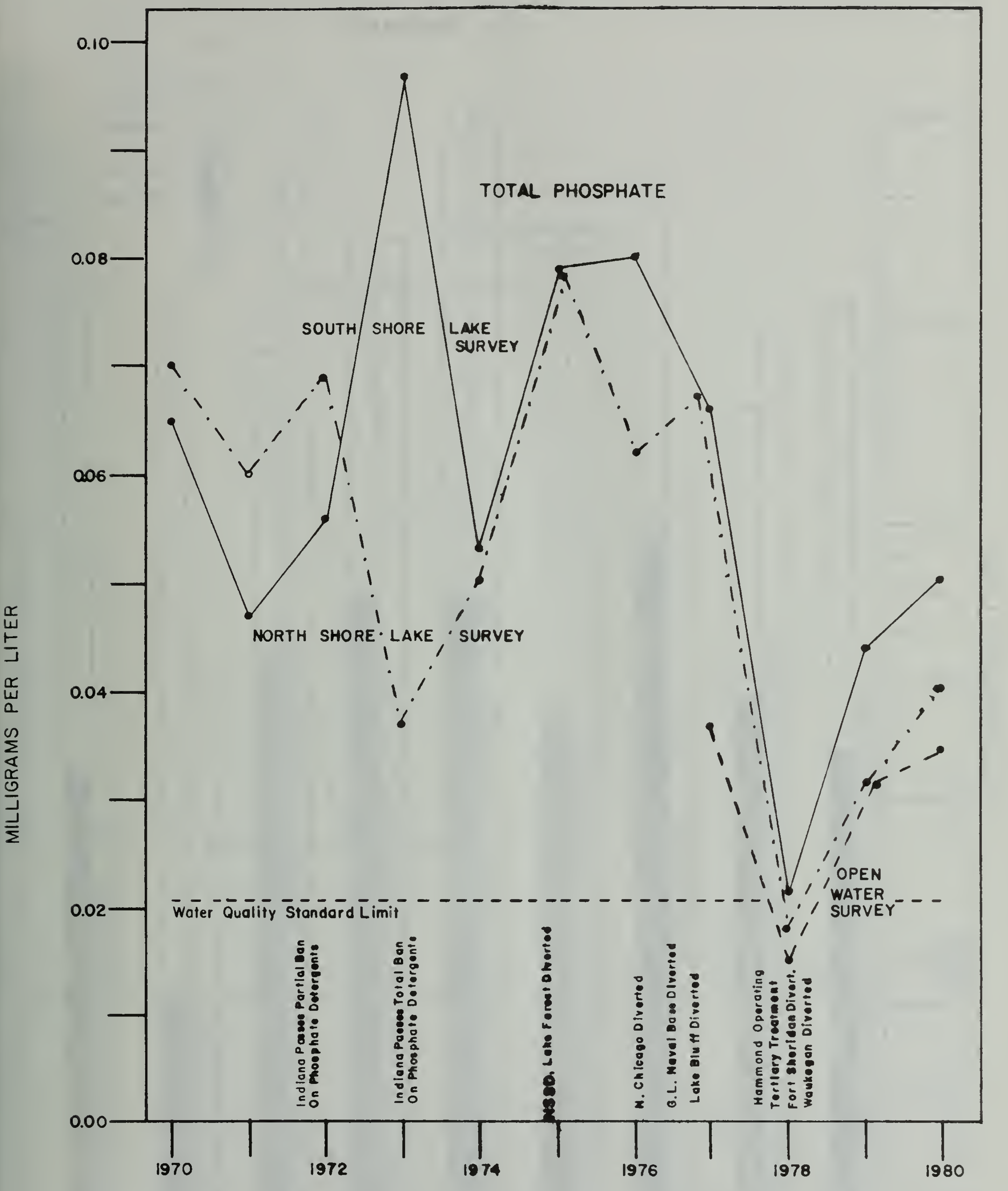
Average levels of ammonia nitrogen continue to drop for the North Shore and Open Water Surveys with the lowest levels recorded during 1980. Ammonia nitrogen average levels for the South Shore Survey dropped from 0.06 mg/l in 1979 to 0.02 mg/l in 1980. This is the first time in the past ten years that ammonia nitrogen has been equal to the IPCB standard of 0.02 mg/l (Figures 14 & 15).

Phytoplankton

In trend analysis of phytoplankton it is important to realize that in the short-term (seasonally or annually) as well as in the long-term (over a set period of years), the finite interpretations of phytoplankton inter-relationships and all the factors that may affect phytoplankton variations are not fully understood. Further data collection and research are necessary to develop greater understanding of these relationships.

Phytoplankton data collected at the Jardine Water Purification Plant crib intake during the past ten years are presented in Figure 16. Phytoplankton are divided into four major groups: diatoms, blue-green algae, pigmented flagellates and green algae.

Figure 12. Total phosphate trends in Lake Michigan, 1970-1980.



WATER QUALITY SURVEILLANCE SECTION

Figure 13. Average and maximum concentrations of total phosphate, 1971-1980.

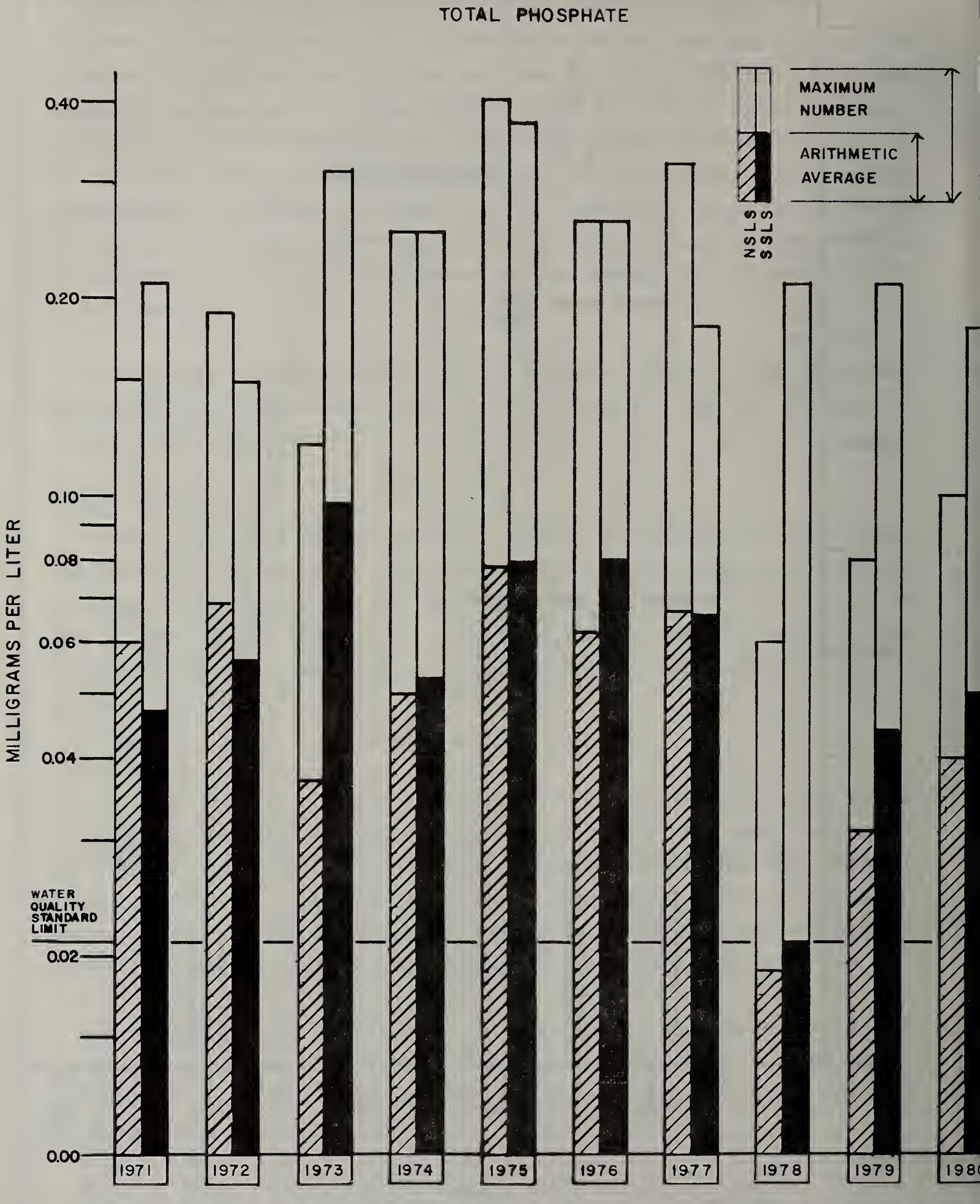


Figure 14. Ammonia nitrogen trends in Lake Michigan, 1970-1980.

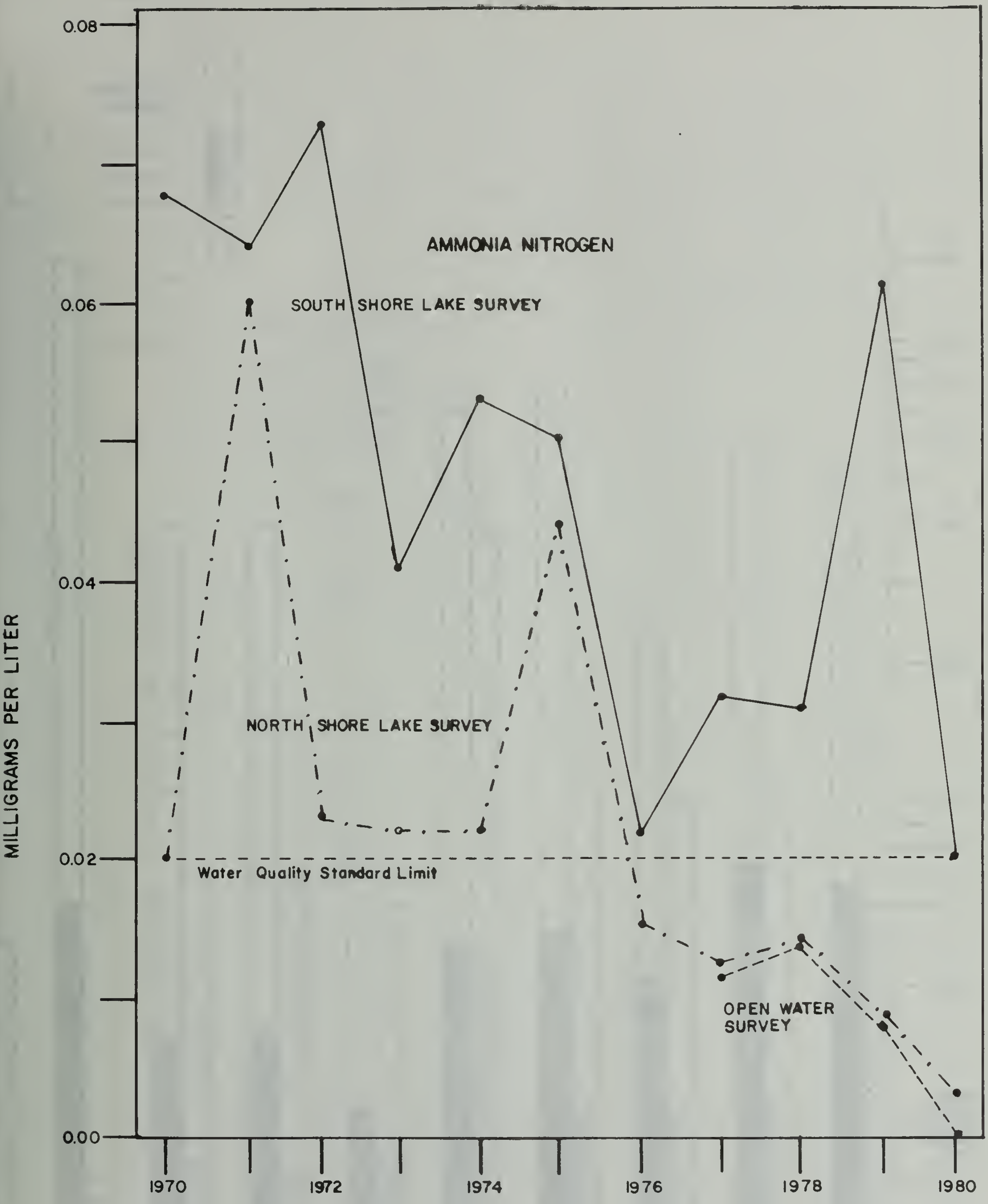


Figure 15. Average and maximum concentrations of ammonia nitrogen, 1971-1980.

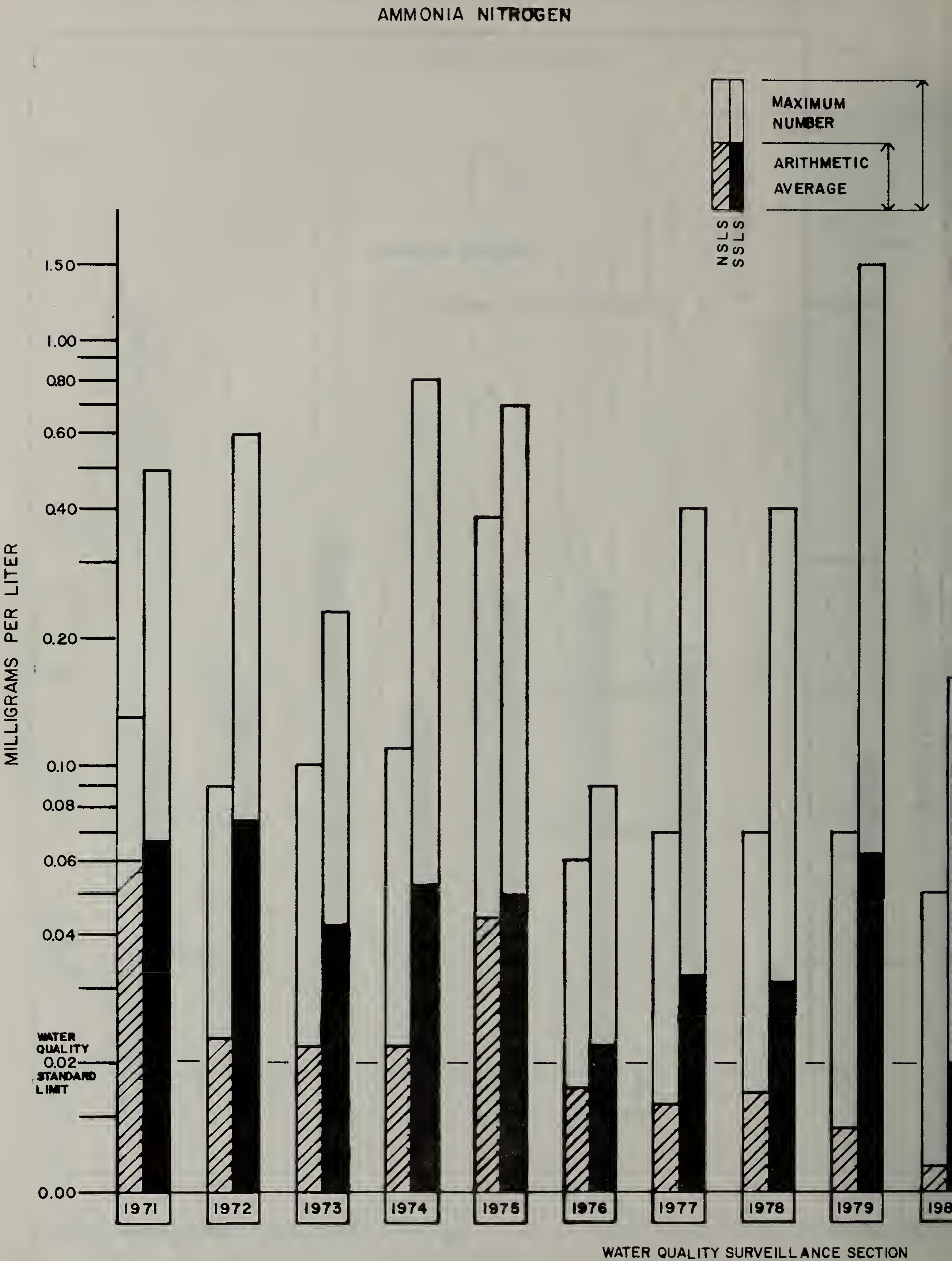
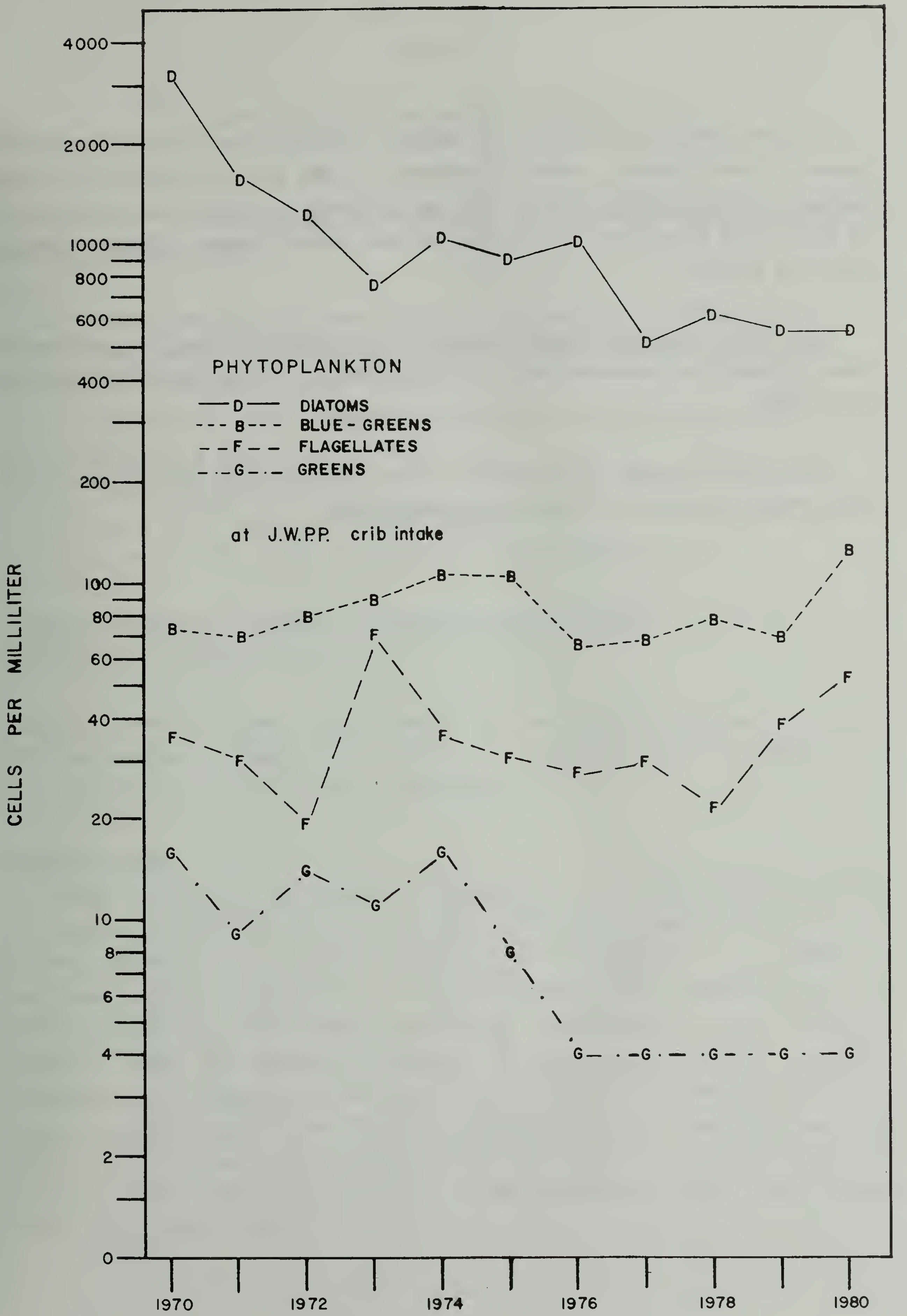


Figure 16. Phytoplankton trends in Lake Michigan, 1970-1980.



Diatoms continue to dominate in numbers over the other three phytoplankton groups. Diatom numbers steadily decreased in the early seventies with some fluctuations from 1973 to 1976. This was followed by another marked reduction in 1977, with a leveling off to the present annual average of approximately 500 cells per ml.

Blue-green algae and pigmented flagellates exhibited yearly variations in number without any apparent trend, although they both have exhibited increases since 1979.

Following a period of fluctuation from 1970 to 1974, green algae levels have remained steady at 4 cells per ml since 1976.

SECTION C

Status of Discharges and Water Quality Events

There has been no change in status for the following discharges (City of Chicago and IEPA, 1980):

1) Abbott Laboratories (Manufacturer of pharmaceutical products).
2) Commonwealth Edison Company, Waukegan Station (Fossil-fueled power generating station).
3) Commonwealth Edison Company, Zion Station (Nuclear-fueled power generating station).
4) Federal installations.
5) North Shore Sanitary District (NSSD).
6) United States Steel, South Works (Steel smelting plant).

Johnson Outboards, Division of Outboard Marine Corporation

(Manufacturer of outboard motors)

Federal funds have been appropriated for an initial program to remove PCB-contaminated sediments from slip No. 3 in Waukegan Harbor. Litigation is in progress relating to the PCB contamination.

MSDGC Overflows

Sewage from all of the Lake Shore municipalities in Cook County is treated by sewage treatment facilities of the Metropolitan Sanitary District of Greater Chicago. The treated effluents are discharged to a system of waterways that are tributary to the Des Plaines River. Historically, the Chicago River and the Calumet River were tributaries of Lake Michigan. However, with the repeated outbreaks of waterborne disease epidemics experienced by Chicago in the late 1800's caused by contamination of the City's drinking water by the flow of polluted river water into the lake, the District constructed a canal system which reversed the direction of flow, diverting flows from Lake Michigan to the Mississippi River via the Des Plaines and Illinois Rivers.

Dilution of these waste flows is provided by diversion of water from Lake Michigan at three points: 1) Wilmette Pumping Station, 2) Chicago River Controlling Works and 3) the O'Brien Lock and Dam. The average diversion, for the accounting year ending February, 1980 from the Lake Michigan watershed to the Des Plaines River watershed, was 3431 cubic feet per second (cfs). This consisted of 1672 cfs of domestic pumpage, and 1759 cfs of storm runoff and direct diversion.

Water levels in the waterways are regulated by the District's lock and dam facility at Lockport, Illinois. Whenever heavy rains are predicted the Lockport dam is opened, lowering the water levels to prevent flood damage. However, during severe rains, the capacity of the waterways to drain away runoff may be exceeded and one or more of the three locks may be opened causing polluted flood waters to reach the lake.

The following indicate the dates, locations, and volumes released during flow reversals in recent years:

DATE	LOCATION	(MILLIONS OF CUBIC FEET)
July 21, 1980	Chicago River	24.6
July 21, 1980	Wilmette	21.1
April 11-12, 1979	Wilmette	1.5
March 4, 1979	Wilmette	6.0
September 17, 1978	Wilmette	13.2
September 13, 1978	Wilmette	4.4
June 30, 1977	Chicago River	39.7
June 30, 1977	Wilmette	3.9
June 11, 1977	Wilmette	5.4
April 24, 1976	Wilmette	18.0
August 21, 1975	Wilmette	17.4
April 18, 1975	Chicago River	151.0
April 18, 1975	Wilmette	12.0
September 17, 1972	Wilmette	12.0
August 25, 1972	Chicago River	7.9
August 25, 1972	Wilmette	25.5
June 14, 1972	Wilmette	2.7

The District is in the construction stage of Phase I of a long-term construction program to control flooding and backflows. The Tunnel and Reservoir Plan (TARP) adopted by the District consists of a system of conveyance tunnels and storage reservoirs to transport and store combined sewage flow during periods of heavy rainfall. Subsequently, these flows, which are presently discharged to the waterways, would be pumped to the District's facilities for treatment.

United States Steel Corporation, Waukegan Works

(Producer of stainless and carbon steel wire and springs)

This facility is closed as of December 31, 1979.

Water Plant Wastes

The City of Waukegan water plant has installed a recycle system with excess flow diverted to the North Shore Sanitary District, Gurnee wastewater treatment plant. The Highland Park water plant has installed a recycle system with excess flow diverted to the North Shore Sanitary District, Clavey Road Wastewater treatment plant.

Beach Closings

During June, July, and August a number of beaches in the Chicago area closed due to pollution from fecal coliform, oils, and grease. Beaches were closed intermittently for a 21-day period. The Hammond Sanitary District and Lever Brothers Company have been cited as the sources of sewage and industrial wastes which caused the closings. Enforcement actions are now pending.

SECTION D

Toxics Monitoring

Toxics monitoring consisted of analysis of water, sediment, and fish samples for pesticides, polychlorinated biphenyls (PCB's) and heavy metals. Detection limits and guidelines for these parameters are given in Table 40.

Pesticides and PCB's evaluated in this study belong to a class of compounds known as chlorinated hydrocarbons. Chlorinated hydrocarbons are extremely resistant to biological degradation and, thus, are persistent in the environment. In water, chlorinated hydrocarbons become concentrated in aquatic organisms, and these concentrations increase exponentially in those organisms at the top of the food web. Synthetic chlorinated hydrocarbons evaluated in this study were polychlorinated biphenyls (PCB's), DDT, lindane, endrin, dieldrin, chlordane, aldrin, heptachlor, heptachlor epoxide, and methoxychlor.

While most heavy metals and trace elements occur naturally in the environment, extensive use of metals in industry often results in concentrations greatly exceeding natural levels. Certain heavy metals are known to be highly toxic to aquatic organisms and cumulative in the food chain (Hesse and Evans 1972). The nine metals evaluated in this study were: arsenic, cadmium, chromium, copper, lead, iron, manganese, mercury and zinc.

Water

Analyses for metals were conducted on water samples collected at stations 5A, 5B, 5C, 5D and 4E on June 5, and September 30, 1980 and at stations 3F, 5G, 5H, 5I and 5J which were collected on May 28 and October 16, 1980. Detectable levels of iron were found at station 5G (50 ug/l) in spring and at stations 5A (58 ug/l), 5B (39 ug/l), 5C (58 ug/l), 5D (45 ug/l), 4E (47 ug/l), 3F (120 ug/l), and 5J (50 ug/l) in the fall. These levels are well below the state standard of 1000 ug/l for general use waters and 300 ug/l for public and food processing water supplies. The remainder of the parameters were below detectable levels.

Stations 5A, 5H, and 5J were sampled once in spring and fall for analysis of chlorinated hydrocarbons. No detectable levels of these compounds were found in spring, or at station 5A in the fall. The results from the fall samples at stations 5H and 5J were not available at the time of this writing.

Sediments

Sediment samples for chemical analysis were collected twice at stations 5A, 5H and 5J and once at staions 1N, 3N, 7N, 2S, 5S and 7S. The results of the September sampling at stations 5A, 5H and 5J were not available at the time of this writing. Concentrations of metals as well as nitrogen, phosphorus, COD and percent volatile solids are given in Table 7. Kelly and Hite (1981) compared sediments from 63 inland Illinois lakes and provided criteria for classifying them. These criteria are included in Table 7 for comparative purposes. All of the Lake Michigan stations were well below these criteria values in 1980.

Detectable levels of PCB's were found at stations 5A (17 ug/kg), 1N (18 ug/kg), 2S (51 ug/kg) and 7S (13 ug/kg). Detectable levels of heptachlor epoxide were found at station 1N (1.1 ug/kg). By comparison, Kelly and Hite (1981) reported maximum concentrations of PCB's and heptachlor epoxide of 56 ug/kg and 13 ug/kg, respectively, for inland lakes of Illinois. The remainder of the parameters were below detectable levels.

Sediment samples were also collected at one station in the Indiana Harbor. Based on the criteria of Kelly and Hite (1981), sediment concentrations of iron (55,000 ug/g), zinc (640 ug/g), and chromium (58 ug/g) were found to be highly elevated (Table 7). Chlorinated hydrocarbons were below detectable levels except for a PCB concentration of 400 ug/kg, which was well above the 56 ug/kg maximum reported by Kelly and Hite (1981).

Fish

A number of actual or potential toxic contaminants are routinely monitored in Lake Michigan fish by the State of Illinois. This includes participation with the Great Lakes Basin States in the implementation of the Great Lakes Fish Monitoring Strategy (GLFMS).

Table 7. Sediment concentrations of volatile solids, nitrogen, phosphorus, chemical oxygen demand (COD) and metals at eight Lake Michigan stations and at one Indiana Harbor station, 1980. Concentrations are ug/g except where noted otherwise.

Date	Stations	Volatile Solids (%)	Total Kjeldahl Nitrogen	Total Phosphorus	COD	Lead	Copper	Iron	Mercury	Zinc	Manganese	Arsenic	Cadmium	Chromium
7/15/80	5A	1.1	930	290	89000	14	22	20500	0.04	65	500	8.5	<0.5	17
	5H	5.4	464	211	27000	12	7	7100	0.03	50	240	2.9	<0.5	10
	5J	3.2	590	262	44000	13	27	24000	0.02	96	460	10.0	<0.5	16
8/26/80	1N	2.4	727	326	55000	29	43	13300	0.05	80	550	7.1	<0.5	11
	7N	1.4	372	400	18000	11	11	9500	0.01	62	330	3.3	<0.5	4
9/3/80	2S	1.8	767	325	57000	31	27	12800	0.06	85	430	6.9	<0.5	13
	5S	1.9	585	272	57000	16	28	18100	0.02	100	430	14.0	<0.5	13
	7S	1.3	305	239	27000	20	21	16200	0.02	130	470	6.1	<0.5	10
	Minimum	1.1	305	211	18000	11	7	7100	0.01	50	240	2.9	<0.5	4
	Maximum	5.4	930	400	89000	31	43	24000	0.06	130	550	14.0	<0.5	17
	Median	1.8	590	281	50000	15	24	14800	0.02	82	440	7.0	<0.5	12
	Mean	2.3	592	291	47000	18	23	15200	0.03	84	430	7.4	<0.5	12
	Standard deviation	1.4	210	59	23000	8	11	5600	0.02	25	98	3.6	-	4
9/3/80	Indiana Harbor	3.6	946	478	98000	120	110	55000	0.13	640	970	20.0	<0.5	58
Highly Elevated (Kelly & Hite, 1981)		>17.0	>7850	>1650	>226500	>150	>150	>45000	>0.40	>250	>3900	>41	>2.6	>38

Table 8. Concentrations of various contaminants in composite samples of coho salmon collected near Kellogg Creek in northern Illinois.

		Sample Number	
Residues (ppm)	1	2	3
Hexachlorobenzene	Trace	Trace	Trace
PCB 1242	-	1.37	-
PCB 1248	0.26	-	0.29
PCB 1254	0.96	0.75	1.07
PCB 1260	0.24	0.19	0.27
pp'DDE	0.59	0.44	0.61
pp'DDD	0.04	0.03	0.05
pp'DDT	0.03	0.04	0.04
Dacthal	Trace	Trace	Trace
Endrin	Trace	Trace	Trace
Dieldrin	0.06	0.05	0.05
Pentachlorophenol Methyl Ether	Trace	Trace	Trace
Heptachlor	Trace	Trace	Trace
Trans Nonachlor	0.07	0.06	0.08
Trans Chlordane	0.03	0.04	0.04
Cis Chlordane	0.05	0.05	0.04
Cis Nonachlor	0.04	0.03	0.04
Octachlor Epoxide	0.01	0.01	0.01
Heptachlor Epoxide	Trace	Trace	Trace
Toxaphene	0.08	0.08	1.0
Mirex	None	0.005	
Alpha BHC	Trace	Trace	Trace
Trifluralin	-	Trace	Trace
Mercury (Total)	0.13	0.12	0.12

Sample Number	Species	Sex	Size in mm	Weight in grams	Sample Location	Collection Date
(1)	Coho Salmon	4 Male 1 Female	605-725	2650-5350	Kellogg Creek	10-14-80
(2)	Coho Salmon	2 Male 3 Female	610-750	2650-5900	Kellogg Creek	10-23-80
(3)	Coho Salmon	3 Male 2 Female	655-720	2500-5250	Kellogg Creek	10-23-80

* estimated.

Fish flesh monitoring is programmed to be completed in cooperation with the Illinois EPA, Illinois Department of Conservation, Illinois Department of Public Health, Illinois Department of Agriculture, the U.S. Department of Health and Human Services, Food and Drug Administration, the Metropolitan Sanitary District of Greater Chicago, and the U.S. Environmental Protection Agency.

Monitoring accomplished in 1980 for which results are available included three composite fillets of coho salmon from Kellogg Creek in Lake County, Illinois. Contaminants monitored included 24 parameters listed in (Table 8). Levels of PCB and DDT were considerably lower than levels previously reported for Lake Michigan salmon, while levels of dieldrin were somewhat higher and exceed the U.S. Food and Drug Administration standard of 0.3 ppm (ug/g).

The fish monitoring program of the U.S. Fish and Wildlife Service reported in previous Lake Michigan annual reports was altered in 1979 to meet monitoring requirements of the International Joint Commission (IJC) involving both Canada and the United States. Trend analysis for bloaters, coho salmon and lake trout analyzed under this program will no longer be available.

The public has been warned of PCB contamination in the Illinois fishing regulations. Consumption of Lake Michigan trout and salmon (coho salmon, chinook salmon, lake trout, rainbow trout and brown trout) should be limited to one meal per week if these fish weigh seven pounds or more. The warning also recommended that women who are or could become pregnant, adolescent girls, nursing mothers and pre-school age children should eat none of the above mentioned fish which weigh seven pounds or more.

SECTION E

Macroinvertebrates

Macroinvertebrates were collected twice at stations 5A, 5H and 5J and once at stations 1N, 3N, 7N, 2S 5S and 7S. Total number of macroinvertebrates ranged from 0 at station 5J in July with a clay bottom to 1251 at station 7N with a sand bottom (Table 9). *Pontoporeia affinis* (77.9%) was the predominant organism collected followed by Chironomidae (14.6%), Sphaeriidae (3.6%), Oligochaeta (2.1%), Hirudinea (0.6%), *Lymnaea sp*. (0.4%), *Physa sp*. (0.4%), *Valvata sp*. (0.3%) and *Asellus sp*. (0.1%). Number of taxa ranged from 0 at station 5J to 7 at station 5A in July (Table 10).

Macroinvertebrates were also collected at one station in the Indiana Harbor. A total of nine organisms were found consisting of Oligochaeta (77.8%) and Hirudinea (22.2%). Degraded conditions at this location were evident based on the sample.

Table 1. Sample depth, bottom type, total number of macroinvertebrates and number of taxa at nine Lake Michigan stations and one Indiana Harbor station, 1980.

Stations	Date	Depth (feet)	Bottom Type	Total Number of Individuals	Numbe of Ta
JWPP-5A	7-15-80	35	Sand, gravel and clay	93	7
	9-18-80	32	Sand, gravel and clay	82	4
SWFP-5H	7-15-80	52	Sand and silt	997	5
	9-18-80	56	Clay and gravel (mostly clay)	8	4
SWFP-5J	7-15-80	37	Clay	0	0
	9-18-80	35	Sand and gravel	218	4
1 N	8-26-80	37	Sand and clay	145	4
3 N	8-26-80	47	Sand and gravel	39	5
7 N	8-26-80	30	Sand	1251	6
2 S	9-03-80	34	Sand and clay	378	6
5 S	9-03-80	32	Sand and gravel	17	5
7 S	9-03-80	50	Sand and gravel	192	6
Indiana Harbor	9-03-80	27	Sand, gravel, tar and oil	9	2

Table 10 . Aquatic macroinvertebrates collected at nine Lake Michigan stations and at one Indiana Harbor station, 1980.

	5A 7-15-80	5H 7-15-80	5J 7-15-80	5A 9-18-80	5H 9-18-80	5J 9-18-80	1N 8-26-80	3N 8-26-80	7N 8-26-80	2S 9-3-80	5S 9-3-80	7S 9-3-80	Indiana Harbor 9-3-80
Amphipoda (scuds)													
Pontoporeia affinis	23	961	--	8	4	195	67	2	1065	210	4	125	--
Isopoda (sowbugs)													
Asellus sp.	--	--	--	--	--	--	1	--	--	--	--	1	--
Gastropoda (snails)													
Lymnaea sp.	1	--	--	--	--	--	--	--	12	1	--	--	--
Physa sp.	2	--	--	9	--	--	--	2	--	--	--	--	--
Valvata sp.	--	--	--	--	--	--	--	2	6	2	--	--	--
Pelecypoda (clams)													
Sphaeriidae (fingernail clam)	20	8	--	--	2	9	1	--	33	27	2	22	--
Diptera													
Chironomidae (midge)	40	6	--	61	1	13	76	32	116	130	5	20	--
Oligochaeta (aquatic earthworm)	3	16	--	4	1	1	--		19	8	3	18	7
Hirudinea (leech)	4	6	--	--	--	--	--	1	--	--	3	6	2
Total number of individuals	93	997	0	82	8	218	145	39	1251	378	17	192	9
Total number of taxa	7	5	0	4	4	4	4	5	6	6	5	6	2

SECTION F

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GLOSSARY OF TERMS

Actinomycetes

A group of organisms related to both fungi and bacteria with the capacity to produce quantities of odoriferous substances. Identification of their relative abundance in a drinking water source provides a parameter in the assessment of water quality. Organic substances such as phenol, cellulose and dead plant cells will provide sufficient carbon and nitrogen to stimulate actinomycetes population growth.

Aldrin

Aldrin is an organochlorine compound primarily used as an insecticide. A fumigant, contact, and stomach pesticide, aldrin is most dangerous when absorbed through the skin. Aldrin is no longer manufactured in the United States. The standard for aldrin in public water supply waters is 1.0 ug/l (IPCB 1977).

Arsenic

Arsenic is ubiquitous in nature with small quantities occurring naturally in some waters (as high as 40 mg/l in thermal springs). Arsenic has been classified as a metalloid; it occurs primarily as metal arsenides and sulfides which may be released from soils and by weathering of rock into water as arsenic oxides. Arsenic exhibits some chemical characteristics similar to phosphorus and occurs in two common valence states, trivalent and pentavalent. The trivalent form is more toxic to mammals (including man), fish, and other aquatic life than the pentavalent (McNeely et al. 1979).

Arsenic had been used in medical treatment for spirochaetal infections and has many diversified industrial uses such as in the manufacture of glass and pigmentation in paints. Arsenicals are used in herbicides, and for many years sodium arsenate was routinely applied to Wisconsin lakes for aquatic plant control (USEPA 1976). Due to its possible toxic effects, the Illinois Pollution Control Board (1977) has set the maximum allowable total arsenic concentration at 1.0 mg/l, except in public and food processing water supplies which shall not exceed 0.1 mg/l total arsenic.

Cadmium

Cadmium is relatively rare in water and occurs in nature chiefly as a sulfide salt most frequently found in association with zinc and lead. Anthropogenic inputs can be significant. Cadmium salts occur in wastes from manufacture of pigments, electroplating plants, and chemical and textile industries. The combustion of fossil fuels releases cadmium to the atmosphere which eventually enters the hydrologic cycle through precipitation. Cadmium can accumulate in soils in the area of mines and smelters resulting in locally high concentrations in water. Cadmium is a non-essential biological element which is cumulative and highly toxic to most organisms including man. Increased hardness and/or alkalinity have been shown to decrease cadmium toxicity (USEPA 1976; McNeely et al. 1979). As a result of the cumulative toxic effect of cadmium, the Illinois Pollution Control Board (1977) has stipulated that waters of the State shall not exceed a concentration of 50 ug/l and water used for food processing and public consumption shall not exceed a concentration of 10 ug/l.

Chlordane

Chlordane is an organochlorine compound primarily used as an insecticide. It is both a stomach and contact insecticide. The standard for chlordane in public water supply waters is 3.0 ug/l (IPCB 1977).

Chloride

Chlorides are one of the most common naturally occurring chemical constituents of surface waters. Sanitary wastes and certain industrial discharges may contribute significant amounts of chloride to receiving waters. At increasing concentrations chloride will cause a slight decrease in the solubility of oxygen in water and can harm metallic equipment along with agricultural plants. The standard for chloride in Lake Michigan is 12.0 mg/l (IPCB 1977).

Chromium

Chromium is an amphoteric metal whose most common oxidation states are +2, +3, and +6. The trivalent and hexavalent forms are of major environmental concern. Because of its low solubility, the trivalent form is rarely found in caters with a pH greater than 5, and when added to most natural waters, is slowly oxidized to the hexavalent form (McNeely et al. 1979). Chromium has many industrial uses. The hexavalent form is used in metal plating, anodizing of aluminum, and in the manufacture of stainless steel, ceramics, paper, and paint. Trivalent chromium is used in photography, in textile dyeing, and in ceramic and glass industries. Chromium is also added to cooling tower waters to inhibit corrosion.

Trivalent chromium is an essential metal for mammals. Deficiencies reduce insulin activation and are known to cause glucose intolerance in humans (USEPA 1976). Hexavalent chromium is toxic to humans. It is irritating and corrosive to the mucus membranes and is a known carcinogen. Both the trivalent and hexavalent ions are toxic to plants. The toxicity of chromium to aquatic life varies from species to species and is dependent on oxidation state, pH, and temperature (McNeely et al. 1979). Due to its possible toxic effects, the Illinois Pollution Control Board (1977) has determined that total hexavalent and trivalent chromium concentrations in water should not exceed 0.05 mg/l and 1.0 mg/l, respectively.

Coliform, Total

Total coliform bacteria are associated with feces of warm blooded animals as well as in soils and on plants. These bacteria are characterized by gram-negative asprogenous rods.

Coliform, Fecal

Bacteria that comprise a portion of the total coliform group. Fecal coliform are of more sanitary significance than total coliform because they are restricted to the intestinal tract of warmblooded animals. Consequently, this group serves as a reliable indicator of recent sewage contamination.

Conductivity

The measure of the ability of a substance to conduct an electric current. The measurement provides an indication of ion concentration or dissolved solids.

Copper

Although generally present in only trace amounts, copper is a common heavy metal constituent of most natural waters. High concentrations of copper may occur in water drainage from mines and some industrial effluents. Copper has been mined and used extensively since prehistoric times. It is used in electrical products, coins, electroplating, and in industrial processes such as gas works, coke ovens and gas scrubbing in steel plants. It is often alloyed with other metals to form bronzes and brasses.

Copper is an essential micronutrient for plants and animals. In plants, it plays a vital role in chlorophyll synthesis and is a constituent of several enzymes. In animals, copper is important in invertebrate blood chemistry as hemocyanin and in hemoglobin synthesis. Like most metallic micronutrients, relatively high concentrations are toxic. Toxicity varies with oxidation state and a number of physicochemical parameters such as temperature, hardness, alkalinity and turbidity. The Illinois Pollution Control Board (1977) standard for total copper in water is 0.02 mg/l for general use waters.

Dichloro diphenyl trichloroethane (DDT)

DDT is an aromatic insecticide which accumulates in the fatty tissues of homeotherms. In the past, DDT was widely used to control agricultural pests, many of which were found to have hereditary resistance to the compound. DDT's use in the United States was prohibited effective January 1, 1973. It is still detected in lakes and streams; the Illinois Pollution Control Board has designated the maximum allowable concentration in public water supply waters to be 50.0 ug/l.

Dieldrin

Dieldrin is an organochlorine compound primarily used as an insecticide. It is endrin's isomer. The use of dieldrin has been banned and its manufacture has been discontinued in the United States. The standard for dieldrin in public water supply waters is 1.0 ug/l (IPCB 1977).

Endrin

Endrin is an organochlorine compound primarily used as an insecticide. The standard for endrin in public water supply waters is 0.2 ug/l (IPCB 1977).

Fungi

Achlorophyllous organisms that are able to grow in the absence of light. Favorable growth followed by a large die-off results in disagreeable tastes and odors.

Heptachlor

Heptachlor, which is an organochlorine insecticide used primarily for termite eradication, not only resists degradation, but oxidizes in or on crops or in the soil and forms heptachlor epoxide. For public and food processing water supply waters, the IPCB has set standards of 0.1 ug/l for both heptachlor and heptachlor epoxide.

Iron

Iron is an abundant element common in many rocks and soils and may be present in water in varying quantities, dependent upon the geology of the area and other chemical components of the waterway. Iron pollution sources include industrial wastes, mine drainage waters, and iron-bearing groundwaters. Iron is an essential micronutrient, and under certain conditions can limit photosynthetic productivity. Iron is toxic at high concentrations (McKee and Wolf, 1971). Iron is considered an objectionable constituent in water supplies, and can affect the taste of beverages and stain laundry. The Illinois Pollution Control Board (1977) has set a maximum allowable iron concentration of 1.0 mg/l in general use waters and 0.30 mg/l in public and food processing water supplies.

Lead

Due to its low solubility, lead concentrations in water are generally not great. Lead enters the aquatic environment through natural sources chiefly by the weathering of its sulfide ores. Input from anthropogenic sources clearly exceeds natural sources. Major inputs result from the burning of leaded fuel, ore smelting and refining, storage battery production, and municipal waste discharges. Lead salts are used in printing and dyeing, photography, engraving, and the manufacture of explosives (McNeely et al. 1979).

Lead is not an essential biological element. It is toxic and accumulates in animal tissues. The degree of toxicity, as with other trace metals, is dependent on numerous water quality parameters such as hardness, alkalinity, pH, and others. The toxic effect of lead concentration on aquatic organisms is highly variable and species dependent (USEPA 1976). In humans the extent and affect of lead toxicity is age dependent, with young children in particular susceptible to neurological impairment. Accordingly, the Illinois Pollution Control Board (1977) has limited maximum allowable concentrations of total lead to 0.1 mg/l in general use waters and 0.05 mg/l in public and food processing water supplies.

Lindane

Lindane is the gamma isomer of 1,2,3,4,5,6 hexachlorocyclohexane (the addition product of benzene and chlorine reacting in direct sunlight). This insecticide is a central nervous system stimulant for which there is no specific antidote. The Illinois Pollution Control Board (1977) has set 4.0 ug/l as the maximum lindane concentration for public and food processing water supply waters.

Manganese

Soils and sediments are important sources of manganese along with metamorphic and sedimentary rocks. Manganese is not usually present in appreciable concentrations in surface waters. It seldom reaches concentrations of 1.0 mg/l in natural surface waters and is usually present at levels of 0.2 mg/l or less (McNeely et al. 1979). Industrial wastes and acid-mine drainage may contribute manganese to waters. Manganese is an essential micronutrient, and under certain conditions can limit photosynthetic productivity. Manganese is considered an objectionable constituent in water supplies, and can affect the taste of beverages and stain laundry. The Illinois Pollution Control Board (1977) has set a maximum allowable manganese concentration of 1.0 mg/l in general use waters and public and food processing water supplies.

Mercury

Mercury, the only liquid metal at ordinary temperatures, is a biologically non-essential trace metal. The majority of U.S. waters contain less than 0.1 ug/l total mercury (USEPA 1976). Historically, because of its toxic effects, mercury was used as a pesticide; however, it use in recent years has been restricted. The major anthropogenic inputs now result from various commercial and industrial processes such as manufacture of paints, mercury switches, dental work, and chlorine gas production.

Mercury compounds are highly toxic to animals, particularly the methylated forms which can be produced by microorganisms from the less toxic inorganic forms. Aquatic organisms are capable of removing mercury directly from water as well as from food. Due to its low elimination rate, mercury is concentrated in body tissues with concentration factors in fish more than 10,000 times greater than aquatic concentrations (USEPA 1976). Due to its high toxic potential and possible biomagnification in aquatic food webs, the Illinois Pollution Control Board (1977) has determined that acceptable levels of total mercury in Illinois waters should not exceed 0.5 ug/l.

Methoxychlor

Methoxychlor is an organochlorine insecticide. It has a long residual action on many species. Not highly toxic to homeotherms, methoxychlor's maximum allowable concentration for public water supply waters is 100.0 ug/l.

Nitrogen, Ammonia

Ammonia nitrogen is one of the compounds resulting from the metabolic activity of living organisms. It may be present in surface waters as a result of agricultural runoff, certain industrial wastes, and runoff from pastures or feedlots. It is a component of sewage and relatively high concentrations may be found in the effluents of sewage treatment facilities. Ammonia is toxic to fishes and toxicity varies with water temperature and pH. The maximum allowable ammonia nitrogen concentration in Lake Michigan is 0.02 mg/l (IPCB 1977).

Nitrogen, Nitrite - Nitrate

Nitrates are the metabolic end products of organic nitrogen decomposition. They are commonly found in surface waters as a result of the decomposition of organic nitrogen in polluted streams and from sewage effluents, agricultural runoff, cesspool leaching, and industrial discharges. Nitrites in natural waters result from bacterial action upon ammonia and organic nitrogen. Because they are readily oxidized to nitrates, nitrites are not normally found in significant concentrations in public water supplies. Nitrate-nitrite may cause infant methemoglobinemia, a disease causing blood changes and cyanosis.

Nitrogen, Organic

Organic nitrogen is defined functionally as organically bound nitrogen. Organic nitrogen includes such natural materials as proteins and peptides, nucleic acids and urea, and numerous synthetic organic materials.

Odor, Threshold

Odor is recognized as a quality factor affecting water in several ways: acceptability of drinking water, tainting of fish and other aquatic organisms, and aesthetics of recreational waters. Odor tests are performed to arrive at qualitative descriptions and approximate quantitative measurements of odor intensity. The method for intensity measurement is the threshold odor test.

Oxygen Demand, Chemical

A measure of the oxygen-consuming capacity of inorganic and organic matter present in water or wastewater.

pH

pH is the logarithm of the reciprocal of the hydrogen ion concentration. pH indicates the balance between the acids and bases in water and is the measurement of the concentration of hydrogen ions. By definition, the pH range is from 0 (most acidic) to 14 (most alkaline). Since the concentration of hydrogen ions regulates the degree of dissociation of many substances, pH may be a significant factor in determining limiting threshold concentrations in natural waters. According to the Illinois Pollution Control Board (1977), the pH of Lake Michigan shall be within the range of 7.0 to 9.0 except for natural causes.

Phenols

Phenols are associated with industrial wastes from coal distillation processes and the manufacture of plastics, dyes, and disinfectants. Relatively small concentrations can cause taste and odor problems in public water supplies.

Phosphate, Total

Phosphate is found in domestic sewage, some industrial wastes, and in drainage from agricultural areas. It is one of the nutrients responsible for excessive algae growth.

Phosphate, Dissolved (total filterable)

The phosphate forms that pass through a 0.45 um membrane.

Plankton

Minute animals (zooplankton) and plants (phytoplankton) suspended in body of water and, because of their physical character or size, are incapable of sustained mobility in directions counter to water currents.

Plate count

Number of colonies of bacteria grown on selected solid media at a given temperature and incubation period. The procedure provides a standardized means of determining the density of bacteria in water.

Polychlorinated biphenyls (PCB's)

PCB's are not pesticides per se, however, the "kill life" of chlorinated hydrocarbon insecticides is extended via the synergistic effects of PCB's. Resistant to degradation by physical and chemical means, PCB's will decompose if heated to 950°C. As a result, even banning the use and manufacture of PCB's in the United States is not completely effective in removing PCB's from the environment. They are insoluble in water and accumulate in the lipids of living systems. Concentrated in the food web, PCB's can cause human disorders ranging from fatigue to bone deformities.

Potassium

Naturally occurring element that is an essential plant nutrient. High concentrations in water may be a result of a discharge, ground water or sedimentary runoff.

Residue, Filterable

The dissolved mineral constituents of water that will pass through a 0.45 um filter and remain after evaporation. Also called total dissolved solids.

Residue, Nonfilterable

The portion of the total residue retained by a 0.45 um filter.

Silica, (SiO_2)

Silica is essential to diatoms, which incorporate it into their exoskeleton. If other nutrients and light are available, diatom populations will increase causing a reduction in silica concentrations.

Sodium

Naturally occurring element in surface waters. Relatively high concentrations may be found in brines and hard waters.

Streptococcal, Fecal

The fecal streptococcal group of bacteria is closely associated with fecal sewage discharges. This group serves as a supplementary indicator of recent sewage contamination.

Sulfate

Sulfate is a component of natural bodies of water. Abnormal fluctuations in background levels may be the result of industrial waste discharges as well as atmospheric precipitation resulting from the burning of fossil fuels. In drinking water supplies, high sulfate concentrations may have a cathartic effect. The maximum allowable sulfate concentration in Lake Michigan is 24.0 mg/l (IPCB 1977).

Turbidity

Turbidity is a measure of the suspended particles such as silt, clay, organic matter, plankton, and microscopic organisms in water which are usually held in suspension by turbulent flow and Brownian movement. Turbidity is measured by comparing the optical interferences of suspended particles to the transmission of light in water in an instrument previously standardized with samples of standard turbidity units.

Zinc

Zinc is a biologically essential trace metal, a necessary component of certain plant and animal enzymes. It is generally found in nature as a sulfide associated with other metals such as lead, copper, cadmium, and iron. Industrially, zinc is important in galvanizing, in the preparation of alloys for die casting, in brass and bronze alloys, and in certain chemical products such as paints, fertilizers, and pesticides.

Zinc is relatively non-toxic to man, with public drinking water concentrations limited on an aesthetic basis. Zinc, however, is acutely and chronically toxic to aquatic organisms, especially fish (McNeely et al. 1979). The degree of toxicity is determined by a number of parameters including pH, DO, hardness, temperature, and alkalinity. The Illinois Pollution Control Board (1977) has set 1.0 mg/l as the maximum allowable zinc concentration in general use waters.

APPENDIX A

Survey Data Sheets

Table 11.

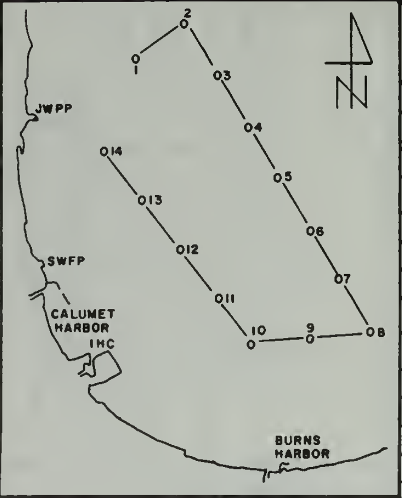
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

CHICAGO-LAKE MICHIGAN OPEN WATER SURVEY

DATE March 26, 1980



PARAMETER	STORET NUMBER	1 CHW201	2 CHW202	3 CHW203	4 CHW204	5 CHW205	6 CHW206	7 CHW207	8 CHW208	9 CHW209	10 CHW210	11 CHW211	12 CHW212	13 CHW213	14 CHW214
		SAMPLING POINT AND STATION NUMBER													
TIME		0851	0917	0935	0953	1011	1029	1047	1105	1123	1141	1159	1217	1235	1253
TEMPERATURE °C	00010	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TURBIDITY F.T.U.	00076	0.65	0.65	0.60	0.60	0.60	0.60	0.65	1.4	1.8	1.6	1.2	1.3	1.5	1.2
ODOR, THRESHOLD	00086	2DF	1M	2DF	2M	2DM	2DF	2M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	22.3	22.8	23.5	23.0	23.3	23.0	21.5	23.5	25.0	20.5	25.0	27.0	26.0	25.0
CHLORIDE mg/l	00940	8.5	9.0	9.3	8.5	8.8	8.0	8.4	8.5	8.6	8.8	8.9	8.0	8.9	8.6
PHOSPHATE, TOTAL mg/l	00650	0.03	0.04	0.03	0.04	0.03	0.02	0.01	0.08	0.08	0.04	0.10	0.04	0.05	0.03
PHOSPHATE, DISSOLVED mg/l	00653	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.01	0.04	<0.01	0.01	<0.01
SILICA mg/l	00956	0.9	0.9	0.9	0.9	0.8	0.9	0.8	0.9	0.8	0.8	0.8	0.8	0.7	0.6
POTASSIUM mg/l	00937	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.3
SODIUM mg/l	00929	4.0	4.1	4.1	4.2	4.1	4.2	4.1	4.1	4.0	4.2	4.0	4.2	4.3	4.4
CONDUCTIVITY µmhos	00095	290	290	280	285	280	290	290	290	285	295	295	290	290	285
RESIDUE, FILTRABLE mg/l	00515	163	164	157	153	156	157	147	153	163	148	146	160	161	160
RESIDUE, NONFILTRABLE mg/l	00530	4	0	3	0	1	6	6	6	4	10	7	1	5	3
OXYGEN DEMAND, CHEMICAL mg/l	00335	6.8	6.8	4.9	5.9	4.9	4.9	4.9	5.9	9.7	5.9	10.7	8.8	14.6	7.8
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.25	0.25	0.24	0.25	0.24	0.24	0.25	0.25	0.28	0.28	0.28	0.28	0.29	0.26
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.20	0.24	0.16	0.12	0.12	0.16	0.16	0.16	0.12	0.18	0.16	0.16
PLATE COUNT 48hr., 35°C PER ml.	31753	39	39	32	3	3	1	1	4	2	270	15	1	2	7
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	40	60	0	20	40	80	60	40	60	60	400	280	240	60
ACTINOS 14 DAY, 26°C PER ml.	80148	1	0	0	0	0	0	0	1	0	0	0	0	0	2
FUNGI PER ml.	31856	0	0	0	0	0	0	0	0	0	1	0	0	0	0
ASBESTOS PER l.	00948	-	2.52x10^5	-	2.51x10^5	-	3.02x10^5	-	2.27x10^5	-	3.26x10^5	-	2.75x10^5	-	3.03x10^5

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200
DIRECTION	00036	N	N	N	N	N
VELOCITY	00035	3	2	3	3	4

PREVAILING WIND 00036 N

SURVEY BY: J. Esposito/J. Vencill

REMARKS

Table 12.

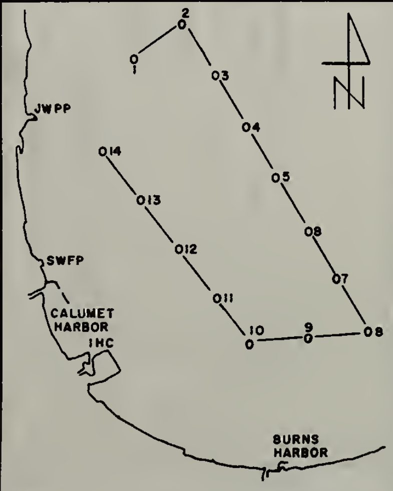
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

CHICAGO-LAKE MICHIGAN OPEN WATER SURVEY

DATE May 15, 19 80



PARAMETER	STORET NUMBER	1 CHW201	2 CHW202	3 CHW203	4 CHW204	5 CHW205	6 CHW206	7 CHW207	8 CHW208	9 CHW209	10 CHW210	11 CHW211	12 CHW212	13 CHW213	14 CHW214
TIME		0853	0911	0929	0947	1005	1023	1041	1059	1117	1135	1153	1211	1229	1247
TEMPERATURE °C	00010	7	5	5	5	5	5	5	6	7	7	6	7	7	8
TURBIDITY F.T.U.	00076	0.35	0.35	0.35	0.35	0.30	0.35	0.30	0.40	0.45	0.35	0.30	0.30	0.35	0.35
ODOR, THRESHOLD	00086	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
SULFATE mg/l	00945	20.0	20.0	20.0	19.4	19.8	21.0	20.0	19.8	20.6	20.3	20.2	20.0	20.3	20.8
CHLORIDE mg/l	00940	9.0	9.2	9.4	8.9	9.3	9.2	9.5	9.5	9.5	9.6	9.6	9.6	9.8	9.5
PHOSPHATE, TOTAL mg/l	00650	0.03	0.03	0.02	0.03	0.01	0.03	0.03	0.02	0.01	<0.01	0.03	0.01	0.03	0.03
PHOSPHATE, DISSOLVED mg/l	00653	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SILICA mg/l	00956	0.7	0.8	0.9	0.9	0.9	1.0	0.9	1.0	0.9	0.9	0.9	0.9	0.8	0.8
POTASSIUM mg/l	00937	1.0	0.9	1.0	1.1	1.1	1.0	1.3	0.9	1.2	1.0	1.0	1.0	1.0	1.0
SODIUM mg/l	00929	4.0	4.0	4.0	3.9	4.0	4.0	4.0	4.0	3.9	4.0	4.0	4.1	3.9	4.9
CONDUCTIVITY μ mhos	00095	280	280	285	285	285	285	280	285	285	280	280	285	8	290
RESIDUE, FILTRABLE mg/l	00515	142	146	144	140	132	139	143	144	134	148	144	140	144	148
RESIDUE, NONFILTRABLE mg/l	00530	9	10	6	6	15	17	3	13	28	8	18	20	6	6
OXYGEN DEMAND, CHEMICAL mg/l	00335	11.7	12.7	11.7	12.7	10.6	9.6	11.7	10.6	12.7	14.9	18.1	20.2	21.2	13.8
NITROGEN, AMMONIA mg/l	00610	0.02	0.02	0.03	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.18	0.18	0.18	0.20	0.19	0.20	0.19	0.19	0.21	0.20	0.18	0.20	0.20	0.20
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.20	0.16	0.12	0.14	0.16	0.16	0.24	0.20	0.20	0.16	0.16	0.16
PLATE COUNT 48hr., 35°C PER ml.	31753	0	2	2	4	0	0	0	0	4	10	0	0	2	5
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	40	160	360	120	160	280	440	200	200	440	260	180	400	560
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASBESTOS PER l.	00948	-	2.04×10^5	-	2.36×10^5	-	1.26×10^5	-	1.41×10^5	-	3.68×10^5	-	2.66×10^5	-	-

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200	1300
DIRECTION	00036	SE	N	N	N	SE	N
VELOCITY	00035	5	4	3	4	3	2
PREVAILING WIND	00036	N					

SURVEY BY: J. Esposito/K. Rudmin

REMARKS:

Table 13.

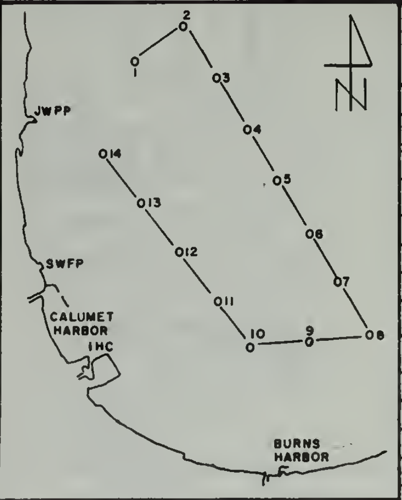
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

CHICAGO-LAKE MICHIGAN OPEN WATER SURVEY

DATE June 17, 19 80



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		CHW201	CHW202	CHW203	CHW204	CHW205	CHW206	CHW207	CHW208	CHW209	CHW210	CHW211	CHW212	CHW213	CHW214
TIME		0849	0907	0925	0943	1001	1019	1040	1058	1116	1134	1152	1210	1228	1246
TEMPERATURE °C	00010	11	11	10	11	11	12	12	13	13	13	13	12	12	13
TURBIDITY F.T.U.	00076	0.60	0.50	0.50	0.35	0.30	0.35	0.30	0.30	0.35	0.30	0.30	0.25	0.35	0.45
ODOR, THRESHOLD	00086	2DM	1M	2M	1M	2M	1M	1M	1M	1M	1M	2M	2M	2M	1M
pH	00400	8.4	8.4	8. 4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	22.0	22.0	22.0	22.0	22.0	22.0	22.0	21.0	22.5	21.0	22.0	22.0	21.5	21.5
CHLORIDE mg/l	00940	7.6	7.8	7.4	7.6	7.5	7.6	7.6	8.0	7.7	8.2	7.7	7.8	7.7	8.0
PHOSPHATE, TOTAL mg/l	00650	0.03	0.03	0.02	0.02	0.02	0.03	0.02	0.06	0.03	0.05	0.01	0.02	0.01	0.03
PHOSPHATE, DISSOLVED mg/l	00653	0.02	0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.03	0.01	0.02	<0.01	<0.01	<0.01	<0.01
SILICA mg/l	00956	0.55	0.55	0.60	0.80	0.60	0.70	0.70	0.65	0.80	0.60	0.60	0.60	0.55	0.55
POTASSIUM mg/l	00937	1.0	1.0	0.9	1.0	0.9	1.0	1.0	1.0	1.1	1.0	1.0	1.0	0.9	1.0
SODIUM mg/l	00929	3.8	3.9	3.9	4.0	3.9	3.9	3.9	3.9	3.9	3.9	3.8	3.8	3.8	3.8
CONDUCTIVITY μ mhos	00095	285	280	285	280	280	280	280	285	285	285	280	275	280	280
RESIDUE, FILTRABLE mg/l	00515	148	160	155	151	149	148	156	150	154	151	157	150	138	142
RESIDUE, NONFILTRABLE mg/l	00530	6	4	7	1	11	8	3	1	4	2	3	4	7	0
OXYGEN DEMAND, CHEMICAL mg/l	00335	6.7	6.7	7.7	7.7	7.7	7.7	6.7	9.6	7.7	10.6	6.7	7.7	7.7	8.7
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.17	0.17	0.17	0.18	0.20	0.17	0.17	0.21	0.20	0.19	0.19	0.19	0.18	0.19
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.16	0.12	0.14	0.16	0.16	0.20	0.20	0.12	0.16	0.08	0.16
PLATE COUNT 48hr., 35°C PER ml.	31753	8	3	4	2	5	4	7	0	0	1	1	0	0	0
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	80	200	180	500	500	100	240	100	320	200	280	240	200	240
ACTINOS 14 DAY, 26°C PER ml.	80148	0	1	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASBESTOS PER l.	00948	-	3.68×10^{5}	-	3.65×10^{5}	-	3.22×10^{5}	-	3.10×10^{5}	-	3.10×10^{5}	-	3.76×10^{5}	-	-

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200	1300
DIRECTION	00036	SE	SE	SE	SE	SE	SE
VELOCITY	00035	1	2	3	7	7	8

PREVAILING WIND 00036 SE

SURVEY BY: J. Esposito/J. Vencill

REMARKS. Lake Conditions Calm

Table 14.

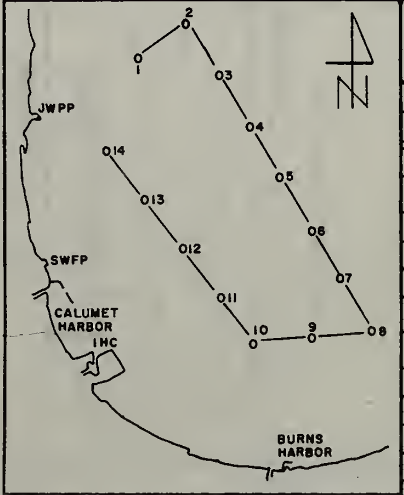
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

CHICAGO-LAKE MICHIGAN OPEN WATER SURVEY

DATE SEPTEMBER 25, 1980



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		CHW201	CHW202	CHW203	CHW204	CHW205	CHW206	CHW207	CHW208	CHW209	CHW210	CHW211	CHW212	CHW213	CHW214
TIME		0849	0907	0925	0943	1001	1019	1037	1055	1113	1131	1149	1207	1225	1243
TEMPERATURE °C	00010	15	13	13	14	14	15	16	16	15	16	15	15	15	15
TURBIDITY F.T.U.	00076	0.60	0.35	0.40	0.35	0.45	0.45	0.50	0.50	0.45	0.50	0.40	0.45	0.45	0.45
ODOR, THRESHOLD	00086	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1DM	1M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	84	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.0	21.3	21.5	21.5	21.5	21.5	21.5	22.0	22.0	21.0	21.0	21.0	21.0	21.0
CHLORIDE mg/l	00940	8.0	7.8	7.6	7.6	7.9	7.6	8.0	8.2	7.6	7.7	7.8	7.7	7.4	7.6
PHOSPHATE, TOTAL mg/l	00650	<0.01	0.02	0.02	0.06	0.04	0.05	0.05	0.04	0.06	0.02	0.04	0.04	0.06	0.06
PHOSPHATE, DISSOLVED mg/l	00653	<0.01	0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	0.02	0.01	0.01	<0.01	0.01	0.01
SILICA mg/l	00956	0.50	0.50	0.55	0.50	0.45	0.50	0.55	0.40	0.40	0.40	0.40	0.40	0.45	0.40
POTASSIUM mg/l	00937	1.2	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.2
SODIUM mg/l	00929	3.5	3.4	3.5	3.5	3.5	3.5	3.5	3.5	3.4	3.4	3.4	3.5	3.4	3.4
CONDUCTIVITY μ mhos	00095	285	280	275	275	275	275	275	275	280	280	280	280	280	275
RESIDUE, FILTRABLE mg/l	00515	159	149	144	155	156	160	148	144	150	149	163	162	154	150
RESIDUE, NONFILTRABLE mg/l	00530	3	3	6	0	2	7	17	8	0	0	13	5	12	0
OXYGEN DEMAND, CHEMICAL mg/l	00335	10.8	12.7	8.8	9.8	8.8	6.9	8.8	10.8	9.8	9.8	8.8	11.8	9.8	9.8
NITROGEN, AMMONIA mg/l	00610	0.01	0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.22	0.22	0.22	0.22	0.23	0.22	0.20	0.22	0.21	0.21	0.23	0.22	0.21	0.20
NITROGEN, ORGANIC mg/l	00605	0.20	0.20	0.20	0.16	0.16	0.16	0.16	0.20	0.16	0.16	0.16	0.16	0.20	0.20
PLATE COUNT 48hr., 35°C PER ml.	31753	1	2	0	0	0	1	3	1	1	0	0	0	0	0
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679														
PLANKTON PER ml.	60050	120	400	580	400	140	520	180	660	680	880	1100	280	260	700
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	0	0	0	0	0	1	0
FUNGI PER ml.	31856	0	1	0	0	0	0	1	1	0	0	0	0	0	0
ASBESTOS PER l.	00948	-	1.76x10^5	-	1.96x10^5	-	1.15x10^5	-	1.97x10^5	-	1.96x10^5	-	1.88x10^5	-	1.45x10^5

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200
DIRECTION	00036	W	W	NW	NE	E
VELOCITY	00035	4	5	6	5	4
PREVAILING WIND	00036	W				

SURVEY BY: J. ESPOSITO/J. VENCILL

REMARKS: LAKE CONDITIONS: MODERATE WITH 2 - 3 FOOT SWELLS

Table 15.

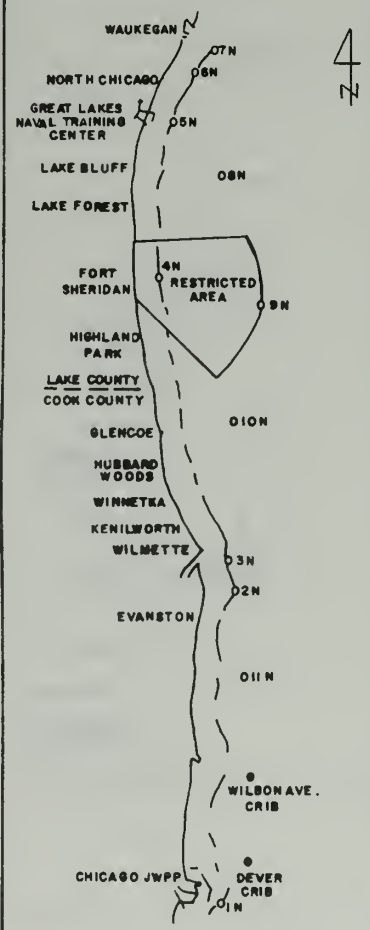
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE JANUARY 17, 19 80



PARAMETER		STORET NUMBER	SAMPLING POINT AND STATION NUMBER									
			1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012
TIME			0814	0913	0923	1041	1048	1100	1027	1004	0945	0853
TEMPERATURE	°C	00010	1	0	0	0	0	0	1	1	0	0
TURBIDITY	F.T.U.	00076	5.2	2.9	3.3	3.9	8.8	8.1	2.6	4.8	2.7	2.2
ODOR, THRESHOLD		00086	1M	1M	1M	1M	1M	1M	1M	2DM	1M	1M
pH		00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE	mg/l	00945	26.5	24.5	24.3	23.5	26.0	25.0	23.5	24.3	24.0	23.5
CHLORIDE	mg/l	00940	10.0	8.2	9.2	9.2	10.1	10.0	10.5	10.5	10.0	9.6
PHOSPHATE, TOTAL	mg/l	00650	0.05	0.06	0.05	0.05	0.10	0.08	0.04	0.05	0.04	0.03
PHOSPHATE, DISSOLVED	mg/l	00653	0.03	0.02	0.01	0.01	0.03	0.02	0.01	0.02	0.01	0.01
CONDUCTIVITY	μ mhos	00095	295	295	295	290	305	300	280	290	290	290
RESIDUE, NONFILTRABLE	mg/l	00530	5	10	6	6	18	20	13	14	3	6
OXYGEN DEMAND, CHEMICAL	mg/l	00335	9.5	9.5	6.7	6.7	8.6	7.6	9.5	8.6	15.2	10.5
NITROGEN, AMMONIA	mg/l	00610	0.04	<0.01	<0.01	<0.01	0.05	0.05	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE	mg/l	00630	0.22	0.23	0.22	0.22	0.24	0.20	0.22	0.22	0.22	0.21
NITROGEN, ORGANIC	mg/l	00605	0.12	0.12	0.12	0.08	0.24	0.12	0.14	0.16	0.16	0.16
PHENOL-LIKE SUBSTANCES	μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35 °C PER ml.		31753	1000	1000	1	3	5	12	0	3	1	60
MF-TC PER 100ml.		31503	56	0	2	20	8	8	0	0	0	0
MF-FC PER 100ml.		31616	4	0	0	0	0	2	0	0	0	0
MF-FS PER 100ml.		31679	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.		60050	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
ACTINOS 14 DAY, 26°C PER ml.		80148	0	0	3	1	3	0	0	0	0	0
FUNGI PER ml.		31856	0	0	0	0	2	1	1	0	0	0

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	S	S	S	SW	NW			
VELOCITY	00035	9	12	10	9	7			S

SURVEY BY: J. ESPOSITO/J. VENCILL

REMARKS
NR No Results

Table 16.

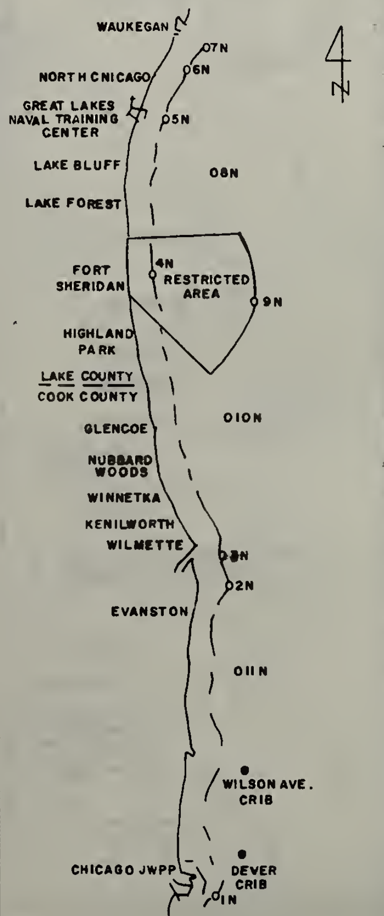
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE May 1, 19 80



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER									
		1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012
TIME		0818	0913	0919	1045	1052	1100	1024	1001	0942	0856
TEMPERATURE °C	00010	8	7	6	6	6	6	5	5	6	7
TURBIDITY F.T.U.	00076	6.0	2.5	2.5	1.5	2.5	5.5	1.0	1.0	1.5	2.0
ODOR, THRESHOLD	00086	2DF	3DF	1M	1M	2DM	2DM	2DM	2M	2M	2M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	22.0	21.0	22.5	23.0	20.0	20.5	21.5	22.3	20.0	21.0
CHLORIDE mg/l	00940	10.5	10.5	10.3	9.8	10.2	11.8	9.1	9.6	9.6	9.5
PHOSPHATE, TOTAL mg/l	00650	0.05	0.06	0.05	0.04	0.05	0.07	0.05	0.04	0.02	0.05
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	<0.01	0.01
CONDUCTIVITY µ mhos	00095	300	290	300	300	300	320	290	295	290	290
RESIDUE, NONFILTRABLE mg/l	00530	8	10	4	0	7	3	3	6	0	8
OXYGEN DEMAND, CHEMICAL mg/l	00335	6.9	6.9	6.9	7.8	8.8	3.9	5.9	6.8	8.8	10.3
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.21	0.21	0.22	0.21	0.23	0.21	0.22	0.21	0.21	0.22
NITROGEN, ORGANIC mg/l	00605	0.16	0.12	0.14	0.12	0.16	0.16	0.12	0.12	0.16	0.20
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	42	3	2	1	5	20	0	2	21	19
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	0	-	0	0	-	0	-	0	-	0
PLANKTON PER ml.	60050	1660	600	1060	900	620	2560	380	180	820	480
ACTINOS 14 DAY, 26°C PER ml.	80148	0	1	0	4	5	6	3	4	2	0
FUNGI PER ml.	31856	0	0	0	1	1	0	0	0	0	0

METEOROLOGICAL DATA							PREVAILING WIND
TIME		0800	0900	1000	1100	1200	00036
DIRECTION	00036	SE	SE	SE	SE	SE	SE
VELOCITY	00035	2	3	3	2	2	

SURVEY BY: J. Esposito/K. Rudmin

REMARKS

Table 17.

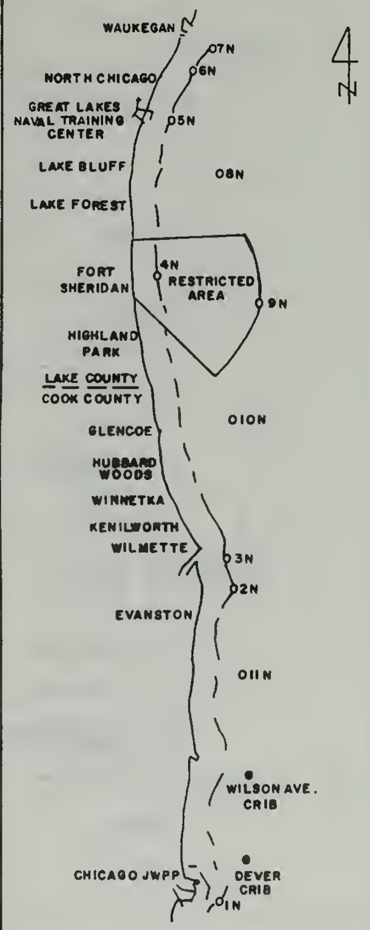
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE May 20, 19 80



PARAMETER		STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
			1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012	
TIME			0813	0912	0917	1043	1050	1058	1021	0958	0939	0853	
TEMPERATURE	°C	00010	12	11	10	9	10	10	8	9	9	10	
TURBIDITY	F.T.U.	00076	0.90	0.90	0.80	0.85	0.95	1.5	0.70	0.65	0.70	0.65	
ODOR, THRESHOLD		00086	1DM	1DM	1M	1M	1M	1M	1M	1M	1M	1M	
pH		00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	
SULFATE	mg/l	00945	24.0	23.0	*	22.5	23.0	23.5	22.0	22.5	22.3	22.8	
CHLORIDE	mg/l	00940	8.2	8.4	8.0	8.2	8.2	8.8	7.6	7.9	8.0	7.7	
PHOSPHATE, TOTAL	mg/l	00650	0.02	0.01	0.01	<0.01	0.01	0.01	0.01	0.01	<0.01	0.01	
PHOSPHATE, DISSOLVED	mg/l	00653	0.05	0.04	0.04	0.04	0.05	0.04	0.05	0.03	0.03	0.04	
CONDUCTIVITY	µ mhos	00095	295	295	290	295	295	295	290	290	295	290	
RESIDUE, NONFILTRABLE	mg/l	00530	21	4	5	20	1	1	5	2	8	3	
OXYGEN DEMAND, CHEMICAL	mg/l	00335	7.7	10.7	8.7	7.7	8.7	8.7	5.8	6.8	7.7	9.7	
NITROGEN, AMMONIA	mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
NITROGEN, NITRITE-NITRATE	mg/l	00630	0.22	0.21	0.21	0.18	0.19	0.20	0.18	0.17	0.17	0.20	
NITROGEN, ORGANIC	mg/l	00605	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.12	0.12	0.12	
PHENOL-LIKE SUBSTANCES	µg/l	32730	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	
PLATE COUNT 48 hr., 35 °C PER ml.		31753	43	6	3	3	6	2	1	5	5	5	
MF-TC PER 100 ml.		31503	0	0	0	0	0	0	0	0	0	0	
MF-FC PER 100ml.		31616	0	0	0	0	0	0	0	0	0	0	
MF-FS PER 100 ml.		31679	0	0	0	0	0	0	0	0	0	0	
PLANKTON PER ml.		60050	500	240	260	400	1260	520	180	940	580	200	
ACTINOS 14 DAY, 26°C PER ml.		80148	1	1	0	4	2	1	2	0	0	0	
FUNGI PER ml.		31856	0	0	0	0	0	0	0	0	0	0	

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100				00036
DIRECTION	00036	N	N	N	N				N
VELOCITY	00035	5	5	6	5				

SURVEY BY: J. Esposito/J. Vencill

REMARKS

One Foot Waves

Light Breeze

*QNS

Table 18.

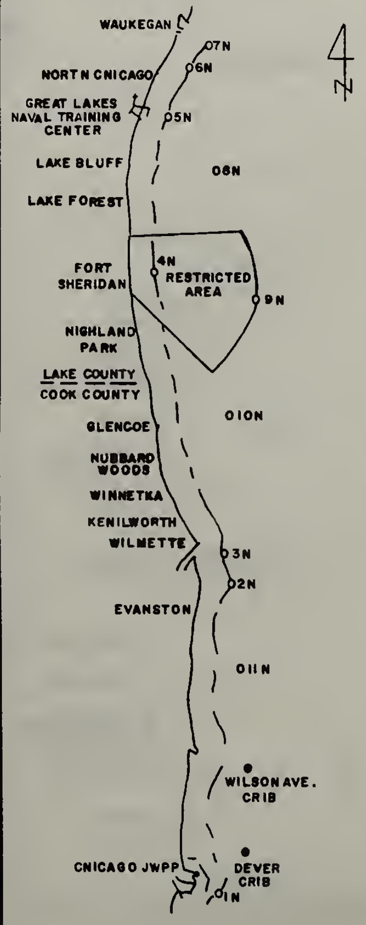
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE June 24, 1980



PARAMETER	STORET NUMBER	1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012
TIME		0812	0913	0918	1039	1046	1055	1022	0959	0940	0852
TEMPERATURE °C	00010	16	14	14	14	14	14	14	14	15	15
TURBIDITY F.T.U.	00076	1.5	1.3	1.2	1.5	1.5	1.0	0.85	1.4	1.4	1.2
ODOR, THRESHOLD	00086	2DF	2M	2DF	2M	2DM	2M	1M	1M	1M	2M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.5	20.5	21.0	21.0	21.4	21.0	20.5	21.5	20.5	21.0
CHLORIDE mg/l	00940	6.9	6.7	6.7	6.5	6.2	6.4	6.2	6.4	6.2	6.5
PHOSPHATE, TOTAL mg/l	00650	0.09	0.05	0.05	0.07	0.07	0.03	<.01	0.04	<.01	0.05
PHOSPHATE, DISSOLVED mg/l	00653	0.04	<.01	<.01	<.01	0.02	<.01	<.01	0.01	<.01	0.01
CONDUCTIVITY μ mhos	00095	285	285	280	285	285	275	275	275	285	285
RESIDUE, NONFILTRABLE mg/l	00530	14	14	5	12	8	15	8	6	12	4
OXYGEN DEMAND, CHEMICAL mg/l	00335	11.8	9.8	6.9	7.8	7.8	7.8	9.8	3.9	4.9	7.8
NITROGEN, AMMONIA mg/l	00610	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.15	0.15	0.15	0.17	0.17	0.18	0.16	0.17	0.16	0.17
NITROGEN, ORGANIC mg/l	00605	0.20	0.16	0.16	0.16	0.16	0.16	0.18	0.16	0.16	0.16
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	58	7	7	0	2	3	4	4	7	8
MF-TC PER 100 ml.	31503	0	0	0	0	0	2	0	0	0	0
MF-FC PER 100ml.	31616	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	140	220	180	20	40	140	100	60	40	320
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	1	0	0	0	0	0

METEOROLOGICAL DATA

								PREVAILING WIND
TIME		0800	0900	1000	1100			00036
DIRECTION	00036	N	N	SE	SE			SE
VELOCITY	00035	2	2	5	6			

SURVEY BY: J. Esposito/J. Vencill

REMARKS:

Waves 0 - 1 Ft.

Table 19.

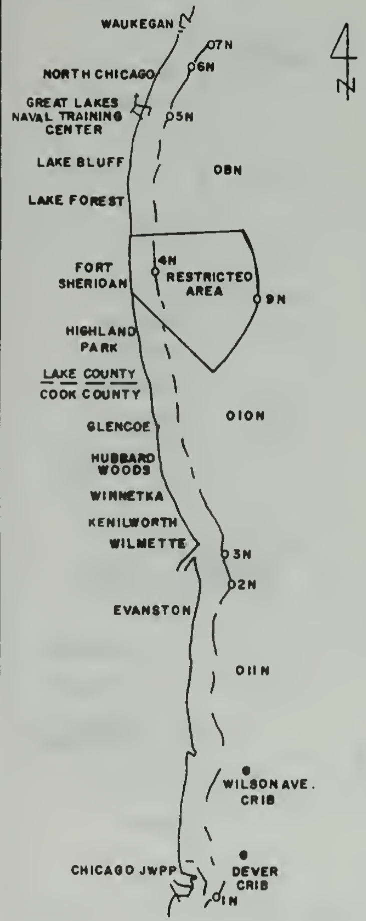
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE JULY 29, 1980



PARAMETER		STORET NUMBER	SAMPLING POINT AND STATION NUMBER									
			1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012
TIME			0818	0917	0922	1016	1053	1059	1026	1003	0944	0858
TEMPERATURE	°C	00010	21	20	20	20	20	20	20	20	20	20
TURBIDITY	F.T.U.	00076	0.70	0.45	0.55	0.50	0.70	0.80	0.35	0.35	0.40	0.65
ODOR, THRESHOLD		00086	2M	1M	1DM	1M	1M	1DM	1Mm	1M	1G	1M
pH		00400	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
SULFATE	mg/l	00945	21.0	21.0	20.5	21.5	22.0	20.0	20.5	21.0	21.2	21.0
CHLORIDE	mg/l	00940	7.9	7.6	7.5	7.2	7.1	7.4	7.3	7.3	7.3	7.5
PHOSPHATE, TOTAL	mg/l	00650	0.04	0.04	0.05	0.01	0.02	0.01	0.01	0.01	0.01	0.01
PHOSPHATE, DISSOLVED	mg/l	00653	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	< 0.01
CONDUCTIVITY	µ mhos	00095	290	285	290	285	285	285	285	280	285	285
RESIDUE, NONFILTRABLE	mg/l	00530	0	9	4	7	1	0	5	3	3	12
OXYGEN DEMAND, CHEMICAL	mg/l	00335	9.9	7.9	15.8	6.9	8.9	8.9	8.9	8.9	8.9	8.9
NITROGEN, AMMONIA	mg/l	00610	0.01	<0.01	0.01	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE	mg/l	00630	0.16	0.16	0.15	0.14	0.14	0.14	0.15	0.15	0.17	0.16
NITROGEN, ORGANIC	mg/l	00605	0.30	0.34	0.10	0.10	0.42	0.26	0.20	0.14	0.14	0.18
PHENOL-LIKE SUBSTANCES	µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35 °C	PER ml.	31753	880	100	330	120	230	320	110	110	40	56
MF-TC	PER 100 ml.	31503	2	4	6	4	20	24	2	4	4	16
MF-FC	PER 100 ml.	31616	0	0	4	0	16	18	0	2	0	2
MF-FS	PER 100 ml.	31679	0	-	0	0	-	0	-	0	-	0
PLANKTON	PER ml.	60050	120	80	1060	20	60	40	0	100	40	80
ACTINOS 14 DAY, 26°C	PER ml.	80148	0	0	0	1	0	0	0	0	0	0
FUNGI	PER ml.	31856	0	0	0	1	1	0	0	0	0	0

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200			PREVAILING WIND 00036
DIRECTION	00036	SE	SE	SE	SE	N			SE
VELOCITY	00035	9	7	6	5	7			

SURVEY BY: J. ESPOSITO/J. VENCILL

REMARKS

MOSTLY CLOUDY
WAVES CALM TO 1 FOOT

Table 20.

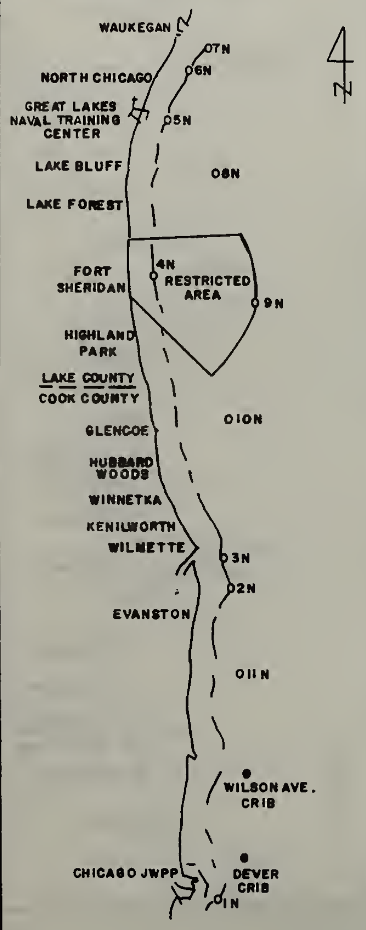
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE September 4, 1980



PARAMETER	STORET NUMBER	1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012
TIME		0824	0924	0932	1054	1101	1106	1036	1013	0954	0905
TEMPERATURE °C	00010	14	13	11	12	13	13	14	14	15	14
TURBIDITY F.T.U.	00076	0.75	0.70	0.65	0.95	0.55	0.65	0.65	0.55	0.45	0.60
ODOR, THRESHOLD	00086	1DF	1M	1M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	21.0	20.5	21.0	20.5	21.0	21.0	21.0	21.0	21.0	21.0
CHLORIDE mg/l	00940	7.3	7.4	7.3	7.5	7.8	7.5	7.1	7.4	7.2	7.6
PHOSPHATE, TOTAL mg/l	00650	0.09	0.07	0.06	0.04	0.05	0.05	0.04	0.05	0.05	0.08
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.01	0.01	0.01	0.01	<0.01	0.01	0.01	0.01
CONDUCTIVITY µ mhos	00095	290	290	285	290	290	290	285	285	290	290
RESIDUE, NONFILTRABLE mg/l	00530	12	8	3	2	7	23	3	6	4	2
OXYGEN DEMAND, CHEMICAL mg/l	00335	1.9	6.6	10.3	1.9	6.6	8.5	1.9	3.8	9.4	0.9
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.02	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.19	0.18	0.19	0.23	0.21	0.23	0.22	0.20	0.20	0.20
NITROGEN, ORGANIC mg/l	00605	0.12	0.24	0.20	0.16	0.16	0.20	0.16	0.16	0.16	0.20
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35 °C PER ml.	31753	60	2	9	62	0	4	3	0	0	0
MF-TC PER 100 ml.	31503	0	0	4	10	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	2	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	0	-	0	0	-	2	-	0	-	0
PLANKTON PER ml.	60050	100	600	2680	2340	1300	340	1400	880	520	600
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	2	1	0	0	0	0	0	0
FUNGI PER ml.	31856	0	0	0	4	1	2	1	2	1	0

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100				00036
DIRECTION	00036	SW	SW	SE	SW				SW
VELOCITY	00035	2	7	8	5				

SURVEY BY: J. Esposito/J. Vencill

REMARKS: Cloudy, Cool
Waves 1 - 2 Ft.

Table 21.

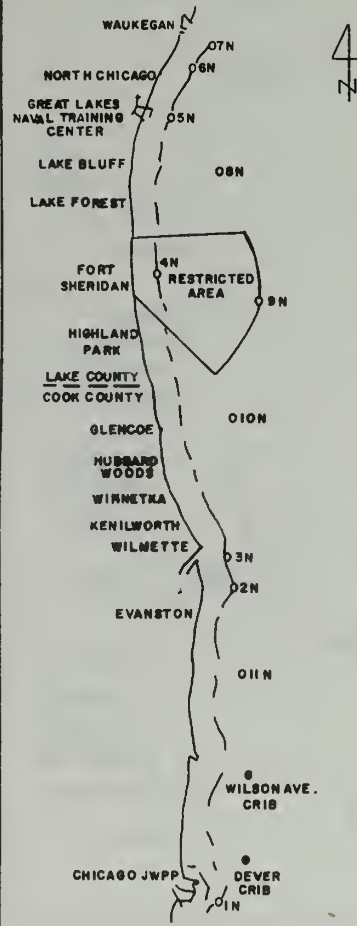
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE October 7, 19 80



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER									
		1N	2N	3N	5N	6N	7N	8N	9N	10N	11N
		CHW013	CHW011	CHW010	CHW005	CHW004	CHW003	CHW006	CHW008	CHW009	CHW012
TIME		0818	0918	0923	1047	1054	1021	1027	1004	0945	0900
TEMPERATURE °C	00010	12	11	11	11	11	11	11	11	11	11
TURBIDITY F.T.U.	00076	3.8	3.1	1.5	1.7	1.7	2.0	0.95	0.75	0.85	1.9
ODOR, THRESHOLD	00086	2DF	2DF	1DF	1M	1M	1M	1M	1M	1DM	1DF
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8. 4	8.4	8.4
SULFATE mg/l	00945	22.5	21.5	21.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0
CHLORIDE mg/l	00940	7.9	7.6	7.7	7.8	8.0	8.2	8.1	7.7	7.6	7.7
PHOSPHATE, TOTAL mg/l	00650	0.06	0.07	0.05	0.04	0.05	0.03	0.04	0.04	0.03	0.04
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.01	0.01	0.01	0.01	0.01	<0.01	0.01	0.01
CONDUCTIVITY μ mhos	00095	285	280	280	285	270	270	280	285	285	285
RESIDUE, NONFILTRABLE mg/l	00530	29	11	3	15	9	2	7	1	3	10
OXYGEN DEMAND, CHEMICAL mg/l	00335	4.1	4.1	5.1	3.1	3.1	4.1	4.1	3.1	5.1	4.1
NITROGEN, AMMONIA mg/l	00610	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.19	0.21	0.19	0.21	0.21	0.23	0.20	0.21	0.19	0.18
NITROGEN, ORGANIC mg/l	00605	0.24	0.16	0.16	0.16	0.20	0.16	0.16	0.16	0.12	0.24
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35 °C PER ml.	31753	1200	130	320	360	610	230	220	320	350	240
MF-TC PER 100 ml.	31503	4	2	2	0	0	2	0	0	0	0
MF-FC PER 100ml.	31616	0	2	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	2	-	0	0	-	0	-	0	-	0
PLANKTON PER ml.	60050	460	1500	1400	1400	460	920	1100	720	280	1100
ACTINOS 14 DAY, 26°C PER ml.	80148	4	NS	0	4	NS	3	NS	1	0	2
FUNGI PER ml.	31856	4	NS	0	5	NS	7	NS	1	1	7

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100				00036
DIRECTION	00036	NW	NW	N	NE				NW
VELOCITY	00035	4	3	2	1				

SURVEY BY: J. Esposito & J. Vencill

REMARKS

Table 22.

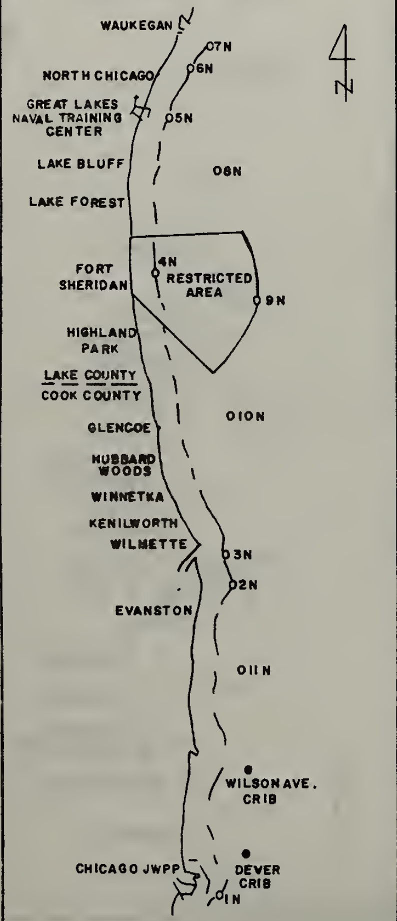
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE November 6, 1980



PARAMETER	STORET NUMBER	1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012
		SAMPLING POINT AND STATION NUMBER									
TIME		0829	0928	0933	1100	1107	1112	1037	1014	0955	0908
TEMPERATURE °C	00010	7	8	8	8	8	8	8	8	8	7
TURBIDITY F.T.U.	00076	3.0	0.70	0.65	1.2	1.8	1.8	0.65	0.55	0.50	1.5
ODOR, THRESHOLD	00086	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.5	20.5	20.3	21.0	21.3	21.3	21.0	20.5	21.0	21.5
CHLORIDE mg/l	00940	7.9	7.9	7.6	7.8	7.7	7.7	7.8	7.8	7.5	7.6
PHOSPHATE, TOTAL mg/l	00650	0.05	0.03	0.03	0.02	0.03	0.03	0.03	0.07	0.06	0.04
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.01	<0.01	0.01	0.01	0.01	0.02	0.02	<0.01
CONDUCTIVITY µ mhos	00095	290	280	280	285	290	290	280	280	285	280
RESIDUE, NONFILTRABLE mg/l	00530	0	3	0	1	3	8	4	2	7	14
OXYGEN DEMAND, CHEMICAL mg/l	00335	11.0	8.0	7.0	7.0	7.0	7.0	6.0	10.0	6.0	9.0
NITROGEN, AMMONIA mg/l	00610	0.01	0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	0.01	0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.19	0.19
NITROGEN, ORGANIC mg/l	00605	0.20	0.20	0.20	0.20	0.20	0.20	0.16	0.12	0.16	0.20
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	< 1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35 °C PER ml.	31753	39	6	4	30	38	25	4	2	5	3
MF-TC PER 100 ml.	31503	4	0	0	0	2	0	0	0	0	2
MF-FC PER 100ml.	31616	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	1460	1140	600	1100	1060	440	1560	1100	960	2980
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	1	0	0
FUNGI PER ml.	31856	0	0	2	0	1	0	0	1	1	1

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100				00036
DIRECTION	00036	SW	SW	SW	SW				SW
VELOCITY	00035	14	15	14	13				

SURVEY BY: Joe Vencill/K. Rudmin

REMARKS: Clear & Sunny,
Strong seas with waves of 2 - 4'

Table 23.

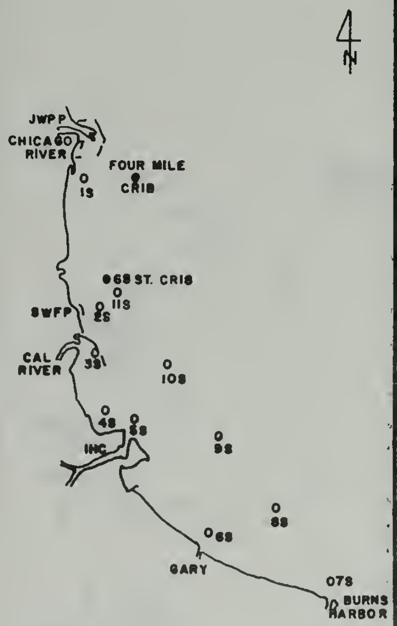
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE March 20, 1980



PARAMETER	STORET NUMBER	1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
TIME		0825	0900	0913	0928	0937	1009	1039	1104	1127	1150	1213
TEMPERATURE °C	00010	3	3	2	3	2	2	1	1	1	2	2
TURBIDITY F.T.U.	00076	2.5	3.0	2.8	3.7	3.7	3.3	1.8	1.0	2.6	2.5	2.7
ODOR, THRESHOLD	00086	2M	2M	1M	2M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.3	8.2	8.3	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	24.0	23.8	24.3	25.0	23.8	23.0	23.0	23.3	24.2	25.0	24.5
CHLORIDE mg/l	00940	10.2	12.0	11.0	15.0	12.0	10.5	10.0	10.5	11.4	11.5	11.3
PHOSPHATE, TOTAL mg/l	00650	0.04	0.06	0.08	0.12	0.08	0.05	0.05	0.04	0.08	0.08	0.08
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.02	0.04	0.07	0.02	0.02	0.02	0.01	0.01	<0.01	<0.01
CONDUCTIVITY μ mhos	00095	292	320	315	340	320	310	305	300	305	305	305
RESIDUE, NONFILTRABLE mg/l	00530	9	5	8	10	9	10	4	5	7	9	12
OXYGEN DEMAND, CHEMICAL mg/l	00335	1.8	2.8	3.7	5.6	4.7	3.7	1.8	1.8	1.8	4.7	7.5
NITROGEN, AMMONIA mg/l	00610	0.02	0.09	0.06	0.30	0.09	0.03	0.02	<0.01	0.02	0.02	0.03
NITROGEN, NITRITE-NITRATE mg/l	00630	0.20	0.22	0.21	0.24	0.21	0.19	0.18	0.17	0.19	0.19	0.19
NITROGEN, ORGANIC mg/l	00605	0.28	0.32	0.28	0.32	0.28	0.44	0.28	0.36	0.20	0.20	0.20
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	20	500	120	2000	2800	27	180	2	3	5	30
MF-TC PER 100ml.	31503	0	14	6	40	50	0	2	0	0	0	4
MF-FC PER 100ml.	31616	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100ml.	31679	0	0	0	0	0	0	2	0	0	0	0
PLANKTON PER ml.	60050	140	440	400	440	220	60	60	20	140	120	280
ACTINOS 14 DAY, 26°C PER ml.	80148	1	0	2	0	1	0	1	0	2	0	5
FUNGI PER ml.	31856	0	0	0	0	3	0	3	0	0	0	0

METEOROLOGICAL DATA								PREVAILING WIND
TIME		0800	0900	1000	1100	1200	1300	00036
DIRECTION	00036	S	S	S	S	SE	SE	S
VELOCITY	00038	12	7	7	11	4	4	

SURVEY BY: J. Esposito/J. Vencill

REMARKS:

Table 24.

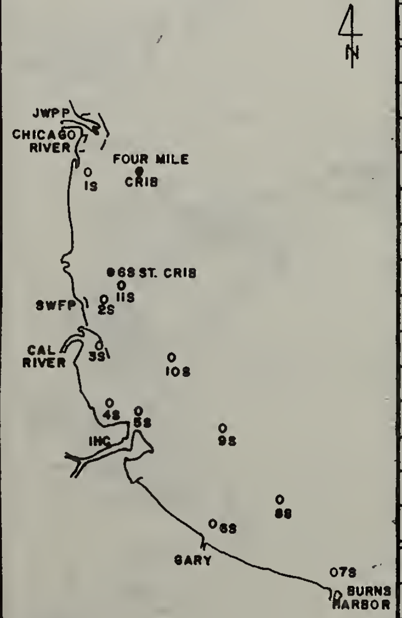
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE May 6, 1980



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
TIME		0826	0902	0914	0930	0940	1012	1040	1103	1126	1149	1212
TEMPERATURE °C	00010	9	9	10	10	10	9	11	8	8	8	9
TURBIDITY F.T.U.	00076	3.1	3.1	3.0	2.7	2.5	1.5	1.9	0.55	0.65	0.80	1.4
ODOR, THRESHOLD	00086	1DM	1M	1M	1M	1M	1M	2DM	1M	1M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	23.4	23.8	24.0	24.5	24.0	25.0	25.3	23.0	23.3	23.3	23.8
CHLORIDE mg/l	00940	9.8	10.2	10.1	9.6	9.5	9.8	10.0	8.8	9.0	9.6	9.6
PHOSPHATE, TOTAL mg/l	00650	0.06	0.07	0.07	0.07	0.07	0.04	0.04	0.04	0.04	0.04	0.04
PHOSPHATE, DISSOLVED mg/l	00653	<0.01	<0.01	<0.01	0.02	0.01	0.01	<0.01	<0.01	<0.01	0.02	0.01
CONDUCTIVITY μ mhos	00095	295	295	300	305	300	300	300	290	290	295	300
RESIDUE, NONFILTRABLE mg/l	00530	26	7	3	8	10	9	1	8	2	7	6
OXYGEN DEMAND, CHEMICAL mg/l	00335	11.1	8.1	3.0	9.1	8.1	11.1	11.1	13.1	8.1	9.1	3.0
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	< 0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.23	0.22	0.22	0.24	0.20	0.21	0.21	0.21	0.22	0.23	0.20
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.16	0.16	0.12	0.12	0.14	0.12	0.24	0.16
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	0	17	9	330	200	32	850	0	5	2	4
MF-TC PER 100ml.	31503	0	0	26	32	12	48	0	0	0	0	0
MF-FC PER 100ml.	31616	0	0	0	2	0	8	0	0	0	0	0
MF-FS PER 100ml.	31679	0	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	100	460	380	420	200	800	80	100	60	0	160
ACTINOS 14 DAY, 26°C PER ml.	80148	1	0	8	6	2	0	0	0	0	2	0
FUNGI PER ml.	31856	12	8	0	1	0	0	1	0	0	0	12

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	NW	NW	S	NW	NW			NW
VELOCITY	00035	3	2	5	9	6			

SURVEY BY: J. Esposito/J. Vencill

REMARKS: 3-4 FT SWELLS

Table 25.

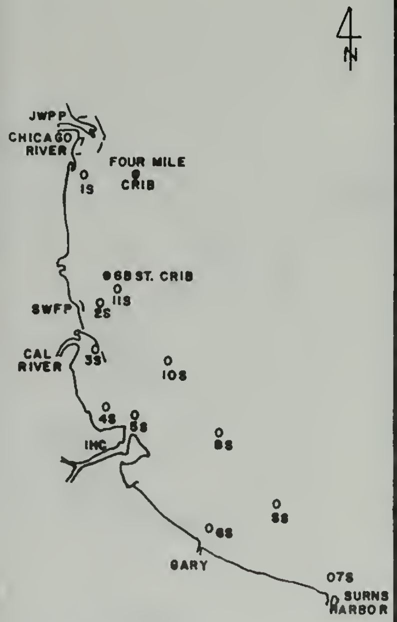
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE June 12, 1980



PARAMETER	STORET NUMBER	1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
		SAMPLING POINT AND STATION NUMBER										
TIME		0828	0903	0915	0930	0939	1015	1043	1106	1129	1152	1215
TEMPERATURE °C	00010	15	15	16	16	15	15	15	14	15	15	15
TURBIDITY F.T.U.	00076	2.0	1.4	1.6	1.4	1.6	1.4	1.5	0.50	0.95	0.50	1.3
ODOR, THRESHOLD	00086	2DF	2DF	2DM	2DM	1M	1M	2M	1M	2M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.0	22.0	21.5	22.8	22.0	22.0	23.5	21.0	21.5	21.5	22.3
CHLORIDE mg/l	00940	8.4	8.6	9.0	9.5	10.8	9.7	9.2	9.1	9.0	8.3	8.3
PHOSPHATE, TOTAL mg/l	00650	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.03	0.03	0.01	<0.01	0.02	<0.01	0.01	<0.01	<0.01	0.02
CONDUCTIVITY μ mhos	00095	280	280	290	285	295	290	285	280	280	285	285
RESIDUE, NONFILTRABLE mg/l	00530	13	3	3	4	3	3	3	6	6	5	4
OXYGEN DEMAND, CHEMICAL mg/l	00335	21.2	8.7	6.7	9.6	10.6	8.7	7.7	9.6	7.7	5.8	7.7
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	0.04	0.10	0.04	0.03	0.01	0.02	<0.01	< 0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.18	0.18	0.17	0.17	0.20	0.18	0.18	0.19	0.17	0.17	0.17
NITROGEN, ORGANIC mg/l	00605	0.12	0.12	0.12	0.10	0.16	0.12	0.12	0.12	0.16	0.08	0.16
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	5	21	93	230	430	160	590	1	74	1	6
MF-TC PER 100ml.	31503	12	90	174	182	186	192	138	2	42	0	2
MF-FC PER 100ml.	31616	2	12	44	66	78	178	74	0	26	0	0
MF-FS PER 100ml.	31679	0	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	0	120	180	260	240	140	200	200	320	320	400
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	1	0	0	0	1	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	1	0	1	0	0	0	0

METEOROLOGICAL DATA

									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	S	SE	S	S	SE			S
VELOCITY	00038	9	6	7	8	8			

SURVEY BY: J. Vencill

REMARKS:

Clear and sunny
Light winds,
Waves 1 - 2'

Table 26.

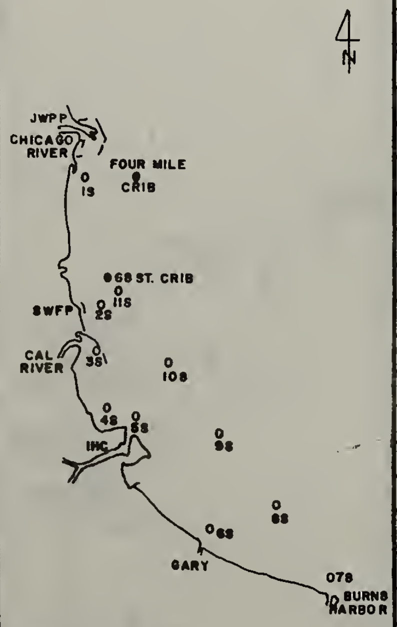
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE JULY 1, 19 80



PARAMETER		STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
			1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	11S
			CHW014	CHW015	CHW017	CHW019	CHW020	CHW021	CHW024	CHW023	CHW022	CHW018	CHW016
TIME			0821	0856	0908	0925	0933	1008	1042	1105	1128	1151	1214
TEMPERATURE	°C	00010	17	17	18	17	19	18	17	17	16	17	17
TURBIDITY	F.T.U.	00076	0.85	0.85	1.4	1.2	1.4	0.75	0.90	0.50	0.50	0.60	0.80
ODOR, THRESHOLD		00086	2DF	2DF	2DF	2CH	2DM	2DM	2DM	2DM	2DM	2DF	2DM
pH		00400	8.5	8.5	8.5	8.5	8.4	8.5	8.5	8.5	8.5	8.5	8.5
SULFATE	mg/l	00945	21.5	21.5	22.0	23.0	25.5	23.0	24.0	22.0	22.0	21.5	23.0
CHLORIDE	mg/l	00940	7.6	7.8	8.8	8.8	10.8	8.6	8.9	7.5	7.6	7.6	7.3
PHOSPHATE, TOTAL	mg/l	00650	0.02	0.02	0.01	0.02	0.03	<.01	0.02	0.01	<.01	<.01	0.03
PHOSPHATE, DISSOLVED	mg/l	00653	0.01	0.01	0.01	0.01	0.02	<.01	0.01	<.01	<.01	<.01	0.02
CONDUCTIVITY	µ mhos	00095	280	285	285	285	290	280	290	275	280	285	285
RESIDUE, NONFILTRABLE	mg/l	00530	6	3	6	3	6	7	4	19	8	12	4
OXYGEN DEMAND, CHEMICAL	mg/l	00335	6.9	6.9	9.8	9.8	9.8	6.9	8.8	8.8	8.8	7.8	8.8
NITROGEN, AMMONIA	mg/l	00610	<.01	0.02	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
NITROGEN, NITRITE-NITRATE	mg/l	00630	0.14	0.14	0.15	0.15	0.17	0.16	0.18	0.16	0.16	0.15	0.15
NITROGEN, ORGANIC	mg/l	00605	0.16	0.16	0.16	0.16	0.20	0.16	0.16	0.14	0.16	0.16	0.16
PHENOL-LIKE SUBSTANCES	µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.		31753	40	24	180	1400	48000	110	240	7	5	40	38
MF-TC PER 100ml.		31503	0	24	72	380	14000	40	60	0	12	72	40
MF-FC PER 100ml.		31616	0	0	4	90	5100	6	0	0	0	32	0
MF-FS PER 100ml.		31679	0	0	0	0	4	0	0	0	0	0	0
PLANKTON PER ml.		60050	240	1100	400	1260	800	400	800	520	440	680	540
ACTINOS 14 DAY, 26°C PER ml.		80148	0	0	0	1	0	0	0	0	0	0	1
FUNGI PER ml.		31856	0	0	0	1	0	1	0	0	0	0	0

METEOROLOGICAL DATA								PREVAILING WIND
TIME		0800	0900	1000	1100	1200		00036
DIRECTION	00036	S	S	S	S	S		S
VELOCITY	00035	12	10	12	10	7		

SURVEY BY: J. Esposito/J. Vencill

REMARKS:

Table 27.

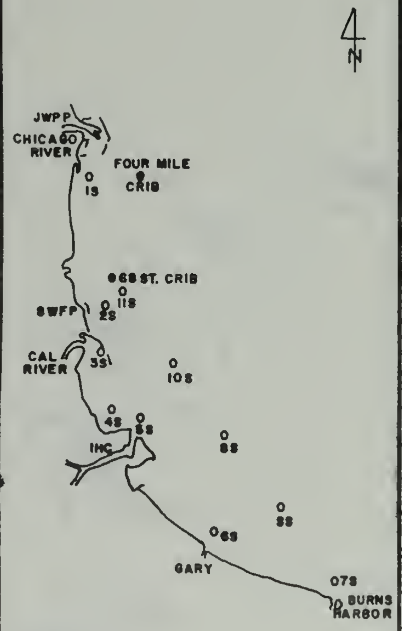
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE August 5, 1980



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
TIME		0820	0853	0911	0926	0934	1011	1043	1106	1129	1153	1216
TEMPERATURE °C	00010	20	20	21	22	22	22	22	22	22	20	20
TURBIDITY F.T.U.	00076	0.70	0.65	0.80	0.65	0.75	0.40	0.50	0.35	0.45	0.55	0.45
ODOR, THRESHOLD	00086	2DF	2DM	2M	2M	2DM	2DM	1M	1M	1M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.0	21.0	21.0	20.5	21.3	20.0	21.0	21.5	21.0	21.0	21.0
CHLORIDE mg/l	00940	8.1	8.2	9.0	9.8	10.5	9.0	9.2	8.9	9.3	9.4	9.0
PHOSPHATE, TOTAL mg/l	00650	0.06	0.06	0.07	0.07	0.14	0.11	0.05	0.03	0.05	0.07	0.05
PHOSPHATE, DISSOLVED mg/l	00653	0.02	0.01	0.02	0.01	< 0.01	0.02	0.01	0.01	0.01	0.02	< 0.01
CONDUCTIVITY µ mhos	00095	290	290	290	290	300	295	285	290	290	285	285
RESIDUE, NONFILTRABLE mg/l	00530	0	1	11	2	11	0	0	6	3	2	4
OXYGEN DEMAND, CHEMICAL mg/l	00335	9.7	7.8	6.8	6.8	6.8	7.8	7.8	9.7	9.7	9.7	6.8
NITROGEN, AMMONIA mg/l	00610	< 0.01	< 0.01	< 0.01	0.10	0.14	< 0.01	< 0.01	< 0.01	< 0.01	0.07	0.04
NITROGEN, NITRITE-NITRATE mg/l	00630	0.20	0.19	0.20	0.20	0.20	0.18	0.19	0.21	0.20	0.20	0.20
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.18	0.16	0.16	0.16	0.14	0.16	0.16	0.20
PHENOL-LIKE SUBSTANCES µg/l	32730	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
PLATE COUNT 48 hr., 35°C PER ml.	31753	320	360	36000	720	19000	5200	1100	150	530	4800	4800
MF-TC PER 100ml.	31503	4	20	24	268	320	0	8	0	0	36	88
MF-FC PER 100ml.	31616	0	4	0	32	32	0	0	0	0	0	20
MF-FS PER 100ml.	31679	0	0	0	0	2	0	0	0	0	0	0
PLANKTON PER ml.	60050	420	1060	60	40	140	60	60	20	20	60	60
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	1	0	0	0	0	0	0	0
FUNGI PER ml.	31856	1	1	1	3	1	3	1	0	0	8	2

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	SE	SE	SE	SE	SE			SE
VELOCITY	00035	8	4	5	4	5			

SURVEY BY: J. Esposito/J. Vencill

REMARKS:

Waves 1 - 3 Ft.

Overcast

Table 28.

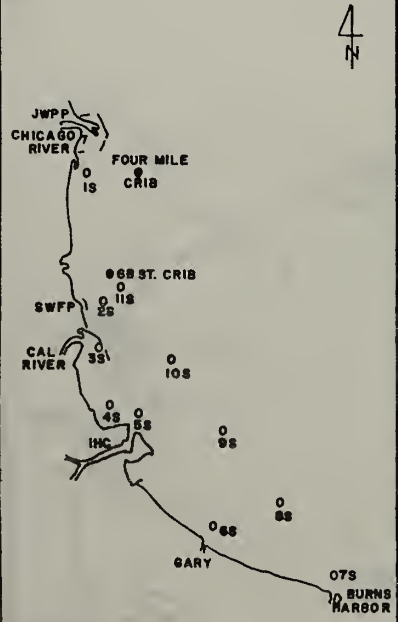
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE August 28, 19 80



PARAMETER	STORET NUMBER	1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
		SAMPLING POINT AND STATION NUMBER										
TIME		0935	1012	1024	1041	1048	1141					1251
TEMPERATURE °C	00010	19	18	18	18	18	19					20
TURBIDITY F.T.U.	00076	0.40	0.40	0.60	0.45	1.6	0.40					0.40
ODOR, THRESHOLD	00086	1M	1M	2M	2M	2M	1M					1M
pH	00400	8.4	8.4	8.4	8.4	8.2	8.4					8.4
SULFATE mg/l	00945	18.0	17.7	17.7	18.0	22.0	18.0					17.5
CHLORIDE mg/l	00940	8.3	8.4	8.6	8.7	15.2	8.6					8.4
PHOSPHATE, TOTAL mg/l	00650	0.04	0.05	0.05	0.07	0.18	0.06					0.04
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.01	<0.01	0.01	0.02					<0.01
CONDUCTIVITY µ mhos	00095	285	295	295	300	335	295					295
RESIDUE, NONFILTRABLE mg/l	00530	6	19	5	6	19	7					11
OXYGEN DEMAND, CHEMICAL mg/l	00335	8.8	5.3	10.5	6.1	6.1	5.3					7.0
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	0.16	<0.01					<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.18	0.20	0.20	0.20	0.20	0.20					0.19
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.20	0.20	0.20					0.12
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1					<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	0	160	4000	650	5200	450					88
MF-TC PER 100ml.	31503	0	4	196	4	900	0					0
MF-FC PER 100ml.	31616	0	0	12	4	20	0					0
MF-FS PER 100ml.	31679	0	0	0	0	6	0					0
PLANKTON PER ml.	60050	120	260	140	240	260	120					100
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0					0
FUNGI PER ml.	31856	0	0	0	0	0	0					0

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	S	S	S	S	S			S
VELOCITY	00035	3	3	4	4	3			

SURVEY BY: J. Esposito/J. Vencill

REMARKS:

Lake Conditions: Heavy Fog
Late Start

Table 29.

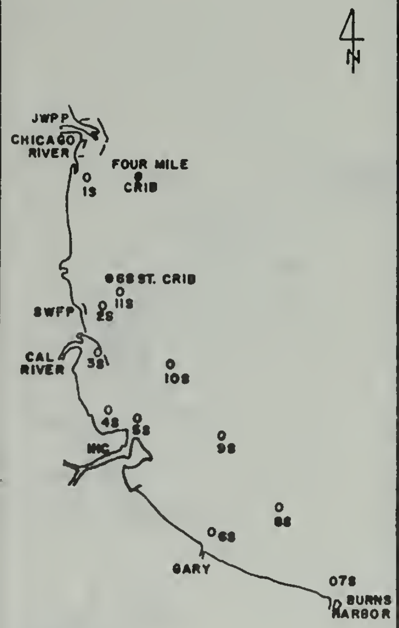
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE SEPTEMBER 16, 19 80



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	11S
		CHW014	CHW015	CHW017	CHW019	CHW020	CHW021	CHW024	CHW023	CHW022	CHW018	CHW016
TIME		0830	0904	0916	0931	0938	1017	1050	1113	1136	1159	1222
TEMPERATURE °C	00010	13	14	15	14	15	14	15	15	13	14	14
TURBIDITY F.T.U.	00076	2.1	1.4	2.0	1.6	1.5	1.3	1.6	0.70	0.80	0.85	1.3
ODOR, THRESHOLD	00086	1DF	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.4	8.4	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.0	22.0	22.0	20.5	23.0	20.0	23.5	20.0	20.0	20.5	20.5
CHLORIDE mg/l	00940	8.7	9.1	9.9	10.4	11.7	10.0	11.1	9.3	9.3	9.2	9.1
PHOSPHATE, TOTAL mg/l	00650	0.07	0.06	0.07	0.06	0.07	0.07	0.06	0.04	0.03	0.03	0.07
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.03	0.03	0.01	0.03	0.03	0.01	0.01	<0.01	<0.01
CONDUCTIVITY µ mhos	00095	280	290	290	300	295	295	305	280	290	290	280
RESIDUE, NONFILTRABLE mg/l	00530	3	1	5	4	11	1	0	1	1	1	6
OXYGEN DEMAND, CHEMICAL mg/l	00335	8.8	10.8	10.8	9.8	9.8	10.8	6.9	8.8	8.8	10.8	10.8
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.18	0.19	0.18	0.21	0.24	0.21	0.22	0.16	0.20	0.19	0.19
NITROGEN, ORGANIC mg/l	00605	0.20	0.20	0.20	0.16	0.16	0.16	0.16	0.12	0.16	0.12	0.12
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	47	240	18000	4600	24000	470	9200	62	78	27	61
MF-TC PER 100ml.	31503	4	420	66000	9000	17000	260	180	36	80	60	32
MF-FC PER 100ml.	31616	4	36	6800	180	390	14	16	2	6	2	0
MF-FS PER 100ml.	31679	2	12	28	8	14	0	0	0	0	0	0
PLANKTON PER ml.	60050	2000	940	2020	2420	1560	1200	600	740	2040	960	740
ACTINOS 14 DAY, 26°C PER ml.	80148	1	1	0	3	0	0	4	0	1	0	0
FUNGI PER ml.	31856	1	1	0	0	0	0	2	0	0	0	0

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	SW	SW	SW	SW	SW			SW
VELOCITY	00038	10	9	10	10	10			

SURVEY BY: J. VENCILL/J. ESPOSITO

REMARKS: OVERCAST

WAVES 1-3 FT.

Table 30.

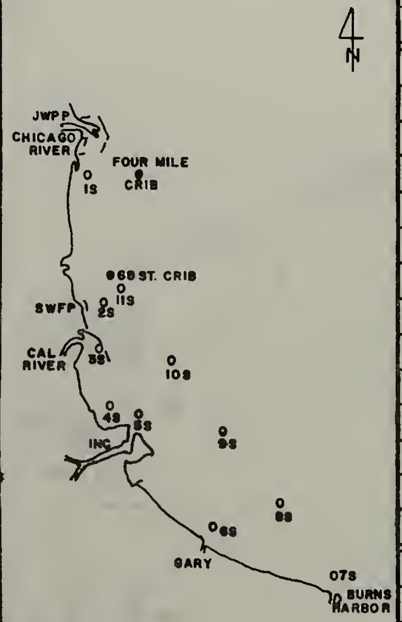
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE October 30, 1980



PARAMETER	STORET NUMBER	1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
TIME		0822	0908	0918	0938	0943	1020	1047	1105	1128	1151	1214
TEMPERATURE °C	00010	8	8	8	8	9	9	9	9	9	9	8
TURBIDITY F.T.U.	00076	3.8	2.5	2.4	2.4	2.0	2.0	1.6	1.3	1.5	1.5	1.5
ODOR, THRESHOLD	00086	1G	1G	2E	3Ch	1G	1G	3DM	1M	1M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.4	20.9	23.5	23.4	23.9	23.5	21.1	20.8	20.5	21.5	22.2
CHLORIDE mg/l	00940	7.9	7.9	8.7	9.1	9.6	9.8	7.9	7.2	7.2	7.4	7.8
PHOSPHATE, TOTAL mg/l	00650	0.04	0.11	0.07	0.06	0.06	0.05	0.06	0.04	0.03	0.02	0.05
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.03	0.03	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01
CONDUCTIVITY μ mhos	00095	290	290	295	290	295	310	290	290	290	295	280
RESIDUE, NONFILTRABLE mg/l	00530	7	0	9	7	15	3	7	1	0	1	14
OXYGEN DEMAND, CHEMICAL mg/l	00335	13.3	7.6	7.6	5.7	7.6	4.7	4.7	1.9	5.7	10.5	10.5
NITROGEN, AMMONIA mg/l	00610	0.02	0.02	0.02	0.03	0.03	0.03	0.01	0.02	0.02	0.02	0.02
NITROGEN, NITRITE-NITRATE mg/l	00630	0.17	0.18	0.22	0.22	0.24	0.24	0.20	0.20	0.21	0.20	0.20
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.16	0.18	0.12	0.16	0.14	0.16	0.20	0.20
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	1800	1800	860	3700	13,000	1100	46	79	24	20	7
MF-TC PER 100ml.	31503	0	8	24	2200	56	40	8	0	0	4	4
MF-FC PER 100ml.	31616	0	0	2	10	54	12	0	4	0	0	0
MF-FS PER 100ml.	31679	0	0	0	2	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	1780	1600	280	580	1440	1100	320	840	220	1080	1760
ACTINOS 14 DAY, 26°C PER ml.	80148	1	0	0	0	0	0	0	1	0	1	0
FUNGI PER ml.	31856	1	1	1	0	0	0	1	1	1	1	1

METEOROLOGICAL DATA

									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	SW	SW	SW	SW	SW			SW
VELOCITY	00035	13	12	9	11	11			

SURVEY BY: J. Esposito/ K. Rudmin

REMARKS:

Table 31.

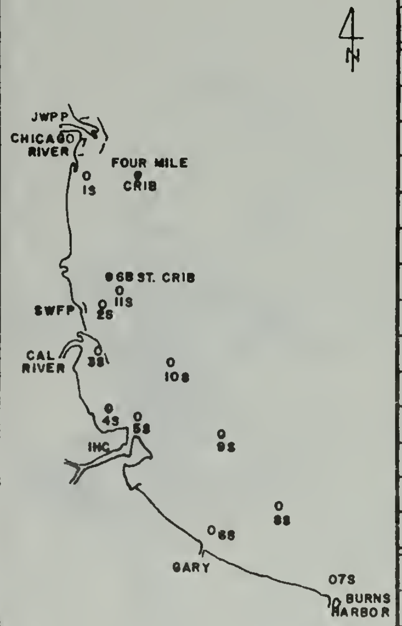
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE November 13, 1980



PARAMETER	STORET NUMBER	1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
		SAMPLING POINT AND STATION NUMBER										
TIME		0821	0858	0908	0925	0934	1010	1040	1106	1129	1152	1215
TEMPERATURE °C	00010	7	7	8	8	8	8	8	8	8	7	7
TURBIDITY F.T.U.	00076	3.1	2.8	2.6	2.9	2.3	2.0	2.1	1.3	1.5	1.6	2.0
ODOR, THRESHOLD	00086	2DM	2DM	1M	1M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	21.0	22.0	21.0	22.5	24.0	22.0	22.0	20.0	21.5	21.5	20.5
CHLORIDE mg/l	00940	8.1	7.9	8.2	8.7	9.6	8.3	8.9	8.3	7.5	7.6	7.5
PHOSPHATE, TOTAL mg/l	00650	0.03	0.06	0.07	0.06	0.07	0.05	0.03	0.02	0.02	0.03	0.07
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	<0.01	0.02	0.01	0.01	0.01	<0.01	<0.01	0.01	0.03
CONDUCTIVITY μ mhos	00095	285	285	285	290	300	290	300	285	285	280	290
RESIDUE, NONFILTRABLE mg/l	00530	5	5	5	6	3	8	6	4	8	3	3
OXYGEN DEMAND, CHEMICAL mg/l	00335	6.8	8.8	8.8	7.8	10.8	6.8	5.9	7.8	7.8	6.8	7.8
NITROGEN, AMMONIA mg/l	00610	<0.01	0.08	<0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.20	0.21	0.23	0.26	0.22	0.23	0.20	0.20	0.20	0.19	0.22
NITROGEN, ORGANIC mg/l	00605	0.20	0.16	0.16	0.16	0.16	0.16	0.16	0.12	0.12	0.12	0.16
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	112	300	420	410	3200	580	420	1600	42	188	232
MF-TC PER 100ml.	31503	8	20	56	52	420	28	20	0	0	0	0
MF-FC PER 100ml.	31616	0	8	22	6	40	2	0	0	0	4	0
MF-FS PER 100ml.	31679	0	0	6	0	4	0	0	0	0	0	0
PLANKTON PER ml.	60050	1020	1320	1520	1020	1200	440	1280	740	660	1420	1080
ACTINOS 14 DAY, 26°C PER ml.	80148											
FUNGI PER ml.	31856											

METEOROLOGICAL DATA

									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	SW	SW	SW	SW	SW			SW
VELOCITY	00035	14	15	13	10	11			

SURVEY BY: J. Esposito/J. Vencill

REMARKS: Waves 1 -3 ft

Table 32.

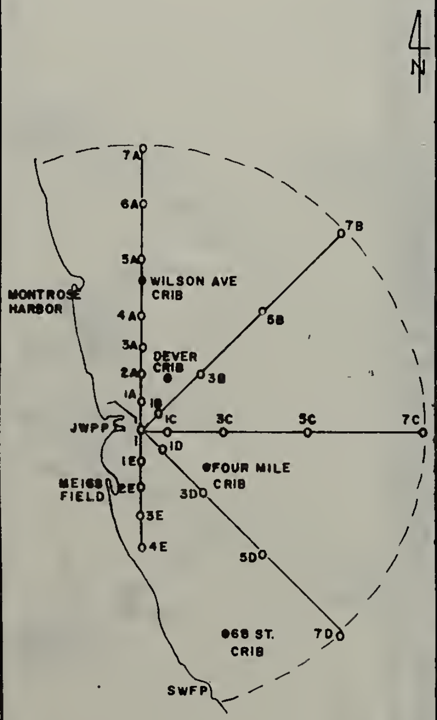
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

J.W.P.P. RADIAL LAKE SURVEY

DATE APRIL 8, 1980



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER																						
		1A	2A	3A	4A	5A	6A	7A	1B	3B	5B	7B	1C	3C	5C	7C	1D	3D	5D	7D	1E	2E	3E	4E
		CHW052	CHW047	CHW042	CHW037	CHW033	CHW029	CHW025	CHW053	CHW043	CHW034	CHW026	CHW054	CWH044	CHW035	CHW027	CHW055	CHW045	CHW036	CHW028	CHW056	CHW051	CHW046	CHW041
TIME		0822	0827	0831	0836	0845	0854	0903	1019	1010	0956	0938	1028	1037	1051	1109	1225	1216	1202	1144	1234	1238	1243	1247
TEMPERATURE °C	00010	5	5	4	4	4	4	4	4	3	3	2	4	4	3	2	4	4	4	3	5	5	5	5
TURBIDITY F.T.U.	00076	4.1	4.0	2.2	1.8	3.2	2.0	2.2	1.4	1.0	1.3	0.45	2.2	1.8	1.0	0.80	2.2	1.6	3.5	0.80	5.0	1.7	4.8	4.5
ODOR, THRESHOLD	00086	2M	1M	1M	1M	1M	2M	2M	1M	1M	1M	1M	1M	2M	1M	1M	1M	1M	2M	1M	1M	1M	2M	1M
pH	00400	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
SULFATE mg/l	00945	20.0	20.0	20.0	22.0	20.5	20.7	21.0	21.3	24.0	23.3	23.0	23.0	20.5	20.7	21.0	21.0	21.0	22.0	23.5	24.5	20.0	21.5	21.7
CHLORIDE mg/l	00940	13.0	12.2	10.1	10.5	11.4	10.4	10.3	10.3	10.1	9.9	9.8	11.0	11.0	9.8	9.6	10.9	10.2	11.3	10.0	12.0	10.0	12.9	11.4
PHOSPHATE, TOTAL mg/l	00650	0.05	<0.01	0.02	0.01	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.05	0.02	0.02	0.01	<0.01	<0.01	0.02	0.03	0.03	0.03
PHOSPHATE, DISSOLVED mg/l	00653	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01
CONDUCTIVITY μ mhos	00095	300	295	290	290	300	285	290	285	285	285	290	295	290	285	290	295	285	300	290	300	290	300	300
RESIDUE, NONFILTRABLE mg/l	00530	13	7	3	0	3	9	4	1	8	13	3	7	0	1	2	14	7	18	7	8	4	6	4
OXYGEN DEMAND, CHEMICAL mg/l	00335	9.0	6.0	6.0	18.0	5.0	4.0	4.0	11.0	32.0	11.0	5.0	7.0	8.0	5.0	8.0	8.0	5.0	4.0	4.0	6.0	7.0	4.0	4.0
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.26	0.26	0.24	0.26	0.28	0.25	0.25	0.24	0.24	0.25	0.21	0.26	0.25	0.23	0.22	0.26	0.23	0.27	0.21	0.28	0.24	0.27	0.26
NITROGEN ORGANIC mg/l	00605	0.16	0.20	0.16	0.20	0.20	0.16	0.20	0.16	0.16	0.16	0.12	0.16	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.16	0.20	0.16	0.16
IRON, TOTAL μg/l	01045	85	80	63	38	95	60	55	30	60	38	10	55	50	70	28	55	55	50	60	32	110	50	62
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.	31753	32	5	9	2	5	6	4	2	6	8	0	3	0	2	2	3	1	520	0	10	0	240	72
MF-TC PER 100 ml.	31503	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	92	0	0	0	0	0
MF-FC PER 100 ml.	31616	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	120	480	240	180	280	0	180	940	320	440	0	700	600	160	240	960	480	280	780.	1360	720	360	200
ACTINOS 14 DAY, 26°C PER ml.	80148	3	4	1	2	8	5	9	5	2	8	0	2	3	0	0	3	2	0	0	2	2	7	1
FUNGI PER ml.	31856	0	0	1	0	2	1	2	0	0	0	0	0	0	0	0	2	0	0	0	2	0	1	0

METEOROLOGICAL DATA									PREVAILING WINDS
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	S	S	S	NW	S			S
VELOCITY	00035	12	10	8	8	4			

SURVEY BY: J. ESPOSITO/J. VENCILL

REMARKS:

Table 33.

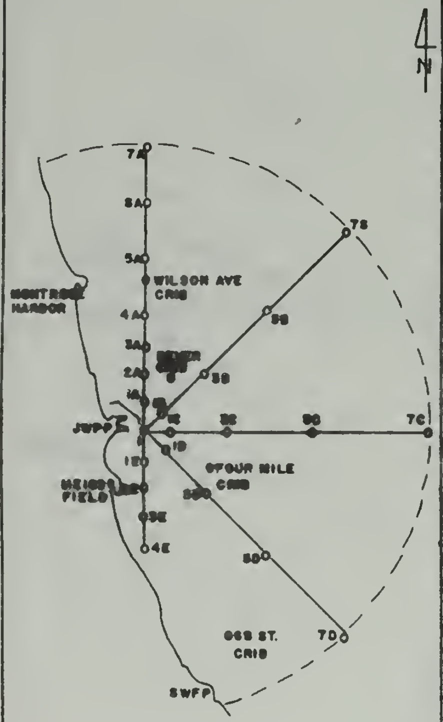
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

J.W.P.P. RADIAL LAKE SURVEY

DATE June 5, 1980



PARAMETER	STORET NUMBER	1A	2A	3A	4A	5A	8A	7A	1B	3B	5B	7B	1C	3C	5C	7C	1D	3D	5D	7D	1E	2E	3E	4E
		CHW052	CHW047	CHW042	CHW037	CHW033	CHW029	CHW025	CHW053	CHW043	CHW034	CHW026	CHW054	CWH044	CHW035	CHW027	CHW055	CHW045	CHW036	CHW028	CHW056	CHW051	CHW046	CHW041
TIME		0814	0819	0823	0828	0837	0846	0855	1011	1002	0948	0930	1020	1029	1043	1101	1217	1208	1154	1136	1221	1226	1230	1235
TEMPERATURE °C	00010	13	14	14	14	14	13	13	13	12	12	12	14	13	12	12	15	14	14	13	15	15	15	15
TURBIDITY F.T.U.	00076	0.85	0.75	0.80	0.65	0.45	0.50	0.40	0.40	0.35	0.35	0.35	0.65	0.40	0.40	0.30	1.3	0.70	0.35	0.35	1.0	0.80	0.80	0.80
ODOR, THRESHOLD	00086	1M	1M	1M	1M	1M	1M	1M	2M	1M	1M	1M	2DM	2DM	1M	1M	2M	1M	2M	1M	1M	1DM	1DF	1DF
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	22.5	23.0	23.0	21.0	22.5	22.5	20.8	21.0	21.0	21.0	21.5	22.5	21.8	23.0	20.2	24.0	23.0	23.0	22.0	23.8	24.0	24.0	23.0
CHLORIDE mg/l	00940	10.1	9.1	8.8	8.7	8.5	9.0	8.8	8.8	9.2	8.7	8.5	8.5	8.6	8.8	8.7	8.6	8.7	8.6	8.5	8.7	8.7	8.8	8.8
PHOSPHATE, TOTAL mg/l	00650	0.08	0.05	0.06	0.08	0.06	0.05	0.06	0.05	0.03	0.03	0.03	0.05	0.11	0.11	0.13	0.33	0.10	0.02	0.01	0.05	0.09	0.02	0.08
PHOSPHATE, DISSOLVED mg/l	00653	0.05	0.01	0.01	0.01	0.01	<.01	<.01	0.01	0.01	0.01	0.01	0.01	0.07	0.08	0.08	0.28	0.07	<.01	0.01	0.01	0.04	<.01	<.01
CONDUCTIVITY µ mhos	00095	290	290	290	290	285	290	290	285	285	285	280	285	285	285	280	285	285	285	285	290	290	285	285
RESIDUE, NONFILTRABLE mg/l	00530	1	8	4	1	0	8	6	0	0	4	0	6	16	6	6	20	14	5	2	6	6	10	13
OXYGEN DEMAND, CHEMICAL mg/l	00335	4.0	8.0	6.0	4.0	7.0	8.0	8.0	6.0	11.0	7.0	11.0	7.0	5.0	6.0	5.0	5.0	5.0	4.0	20.0	3.0	11.0	7.0	10.0
NITROGEN, AMMONIA mg/l	00610	<.01	<.01	<.01	<.01	<.01	<.01	<.01	0.01	0.03	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	0.03	0.03
NITROGEN, NITRITE-NITRATE mg/l	00630	0.18	0.18	0.17	0.17	0.18	0.17	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.18	0.18	0.17	0.17	0.17	0.18	0.17	0.17	0.17	0.17
NITROGEN ORGANIC mg/l	00605	0.20	0.16	0.16	0.16	0.16	0.16	0.20	0.16	0.12	0.12	0.16	0.16	0.16	0.18	0.12	0.08	0.16	0.16	0.12	0.12	0.16	0.12	0.12
IRON, TOTAL µg/l	01045	36	42	10	10	<10	<10	45	26	<10	<10	<10	53	<10	16	<10	18	10	54	36	60	48	30	55
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.	31753	35	21	15	16	9	8	10	7	11	9	5	13	5	3	27	15	12	3	18	11	8	10	7
MF-TC PER 100 ml.	31503	4	8	0	0	0	0	2	0	0	0	0	4	2	0	2	12	2	4	0	8	14	4	8
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	380	800	100	560	240	480	360	160	240	240	80	340	260	460	180	380	360	300	320	180	200	380	200
ACTINOS 14 DAY, 26°C PER ml.	80148	1	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
FUNGI PER ml.	31856	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0

METEOROLOGICAL DATA								PREVAILING WINDS
TIME		0800	0900	1000	1100	1200	1300	00036
DIRECTION	00036	SE	SE	SE	SE	SE	SE	SE
VELOCITY	00035	10	12	13	12	11	11	

SURVEY BY: J. Esposito/ J. Vencill

REMARKS: Duplicate IEPA samples at 5A, 5B, 5C, 5D and 4E.
Split pesticide sample at 5A.

Table 34.

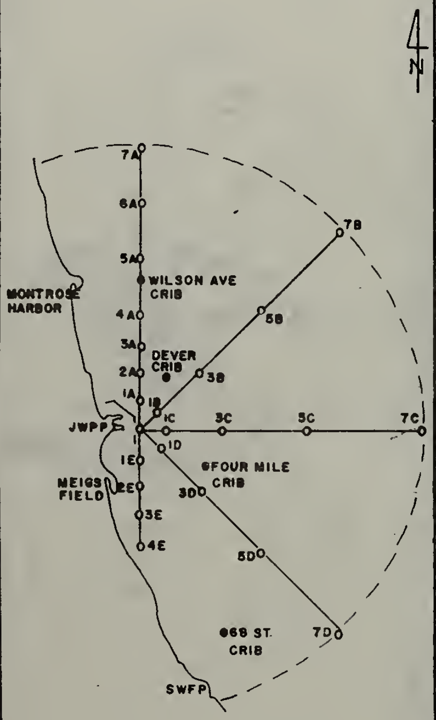
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

J.W.P.P. RADIAL LAKE SURVEY

DATE July 10, 19 80



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER																						
		1A	2A	3A	4A	5A	6A	7A	1B	3B	5B	7B	1C	3C	5C	7C	1D	3D	5D	7D	1E	2E	3E	4E
		CHW052	CHW047	CHW042	CHW037	CHW033	CHW029	CHW025	CHW053	CHW043	CHW034	CHW026	CHW054	CWN044	CHW036	CHW027	CHW055	CHW045	CHW038	CHW028	CHW056	CHW051	CHW046	CHW041
TIME		0816	0821	0825	0830	0839	0848	0857	1013	1004	0950	0932	1024	1033	1047	1105	1224	1215	1201	1143	1229	1233	1238	1242
TEMPERATURE °C	00010	18	18	18	18	18	18	18	19	18	17	17	19	18	18	18	19	19	20	19	20	20	20	20
TURBIDITY F.T.U.	00076	0.75	0.65	0.65	0.50	0.60	0.50	0.50	0.50	0.35	0.30	0.60	0.60	0.45	0.45	0.35	0.55	0.45	0.50	0.40	0.70	0.70	0.55	0.70
ODOR, THRESHOLD	00086	1DF	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1DM	1M	1M	1DM	1M	1DM	1M	1M	1M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.0	21.0	20.5	20.5	20.8	20.8	21.3	21.0	21.0	21.5	21.5	21.5	22.3	21.5	22.0	22.0	22.0	22.5	22.3	22.5	21.5	21.5	22.5
CHLORIDE mg/l	00940	6.4	6.9	7.5	7.5	6.3	6.4	6.4	6.4	6.2	6.3	6.2	6.3	6.1	6.4	6.2	6.2	6.4	6.3	6.1	6.2	6.3	6.3	6.0
PHOSPHATE, TOTAL mg/l	00650	0.03	0.02	0.02	0.02	0.03	0.05	0.03	<.01	0.04	0.06	0.03	0.03	0.03	0.03	<.01	0.02	0.03	0.05	<.01	0.03	0.06	0.06	0.02
PHOSPHATE, DISSOLVED mg/l	00653	0.03	0.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	0.05	0.01	0.01	<.01	<.01	<.01	0.02	0.01	<.01	<.01	<.01	0.01	0.01	0.01
CONDUCTIVITY μ mhos	00095	290	290	290	290	290	280	285	285	285	285	280	285	280	285	285	285	285	285	285	285	285	290	290
RESIDUE, NONFILTRABLE mg/l	00530	10	5	3	7	1	10	8	10	13	3	10	8	13	8	5	2	2	8	6	8	2	1	6
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.8	7.8	10.8	7.8	7.8	6.9	7.8	2.9	9.8	7.8	7.8	8.8	7.8	8.8	3.9	9.8	8.8	12.7	5.9	6.9	6.9	7.8	6.9
NITROGEN, AMMONIA mg/l	00610	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	0.03	0.08	0.03	0.09
NITROGEN, NITRITE-NITRATE mg/l	00630	0.14	0.14	0.16	0.15	0.15	0.15	0.15	0.14	0.15	0.15	0.15	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.15	0.14	0.15	0.15
NITROGEN ORGANIC mg/l	00605	0.16	0.16	0.12	0.16	0.20	0.24	0.16	0.20	0.16	0.12	0.12	0.16	0.16	0.20	0.16	0.20	0.16	0.16	0.16	0.16	0.08	0.20	0.44
IRON, TOTAL μg/l	01045	<10	12	<10	10	10	15	<10	10	<10	<10	15	18	<10	<10	22	16	10	12	<10	15	<10	<10	<10
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.	31753	520	42	320	360	160	260	420	380	350	390	300	220	78	72	52	56	56	26	12	12	12	16	10
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	220	-	700	-	240	-	140	700	220	120	720	120	360	140	1520	80	300	40	120	180	-	860	-
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI PER ml.	31856	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0

METEOROLOGICAL DATA									PREVAILING WINDS
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	NE	N	N	N	SE			N
VELOCITY	00035	0	0	0	0	4			

SURVEY BY: J. Esposito/J. Vencill

REMARKS:

Lake Conditions Calm

Table 35.

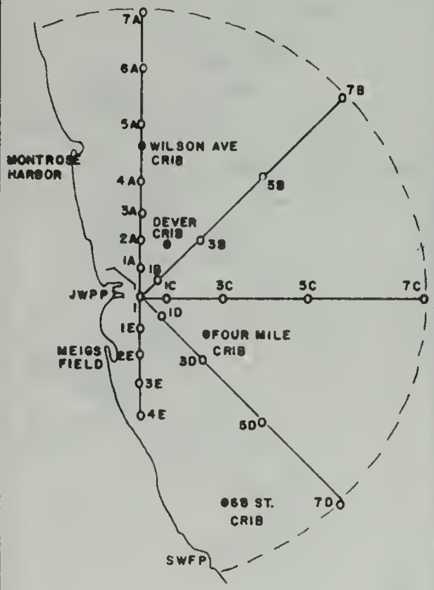
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

JWPP RADIAL LAKE SURVEY

DATE SEPTEMBER 30, 1980



PARAMETER	STORET NUMBER	1A CHW052	2A CHW047	3A CHW042	4A CHW037	5A CHW033	6A CHW029	7A CHW025	1B CHW053	3B CHW043	5B CHW034	7B CHW026	1C CHW054	3C CWH044	5C CHW035	7C CHW027	1D CHW055	3D CHW045	5D CHW036	7D CHW028	1E CHW056	2E CHW051	3E CHW046	4E CHW041
TIME		0823	0827	0832	0836	0846	0855	0904	1020	1011	0957	0939	1029	1038	1052	1110	1231	1222	1208	1150	1236	1240	1245	1249
TEMPERATURE °C	00010	14	14	14	14	14	14	14	14	14	14	13	15	15	15	14	15	15	15	15	15	15	15	15
TURBIDITY F.T.U.	00076	1.4	1.4	1.4	1.2	1.3	0.80	1.2	0.80	0.90	0.75	0.65	0.90	0.70	0.60	0.50	1.2	0.70	0.60	0.55	1.3	0.95	0.80	0.80
ODOR, THRESHOLD	00086	2DF	1DF	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	22.0	20.5	21.0	20.5	20.5	20.5	20.0	21.0	21.5	20.0	20.0	21.0	20.5	21.0	21.0	21.5	22.0	21.0	21.5	21.5	21.3	22.0	21.5
CHLORIDE mg/l	00940	8.1	7.9	7.5	7.7	7.8	8.0	7.8	8.3	8.3	7.7	7.8	8.1	8.1	8.2	7.6	8.2	8.1	7.8	7.8	8.3	8.2	8.2	8.0
PHOSPHATE, TOTAL mg/l	00650	0.02	0.06	0.05	0.04	0.06	0.06	0.03	0.05	0.05	0.05	0.05	0.06	0.03	0.05	0.04	0.04	0.03	0.04	0.05	0.05	0.05	0.05	0.05
PHOSPHATE, DISSOLVED mg/l	00653	<.01	0.02	<.01	0.02	0.02	<.01	<.01	<.01	<.01	0.02	<.01	0.01	<.01	<.01	<.01	<.01	0.01	0.02	<.01	0.01	<.01	<.01	<.01
CONDUCTIVITY µ mhos	00095	285	280	280	280	285	290	285	285	285	285	280	280	280	280	280	285	285	285	285	290	290	290	285
RESIDUE, NONFILTRABLE mg/l	00530	11	6	8	1	9	3	7	7	7	5	17	5	4	8	5	26	1	9	1	8	3	15	0
OXYGEN DEMAND, CHEMICAL mg/l	00335	11.0	11.0	10.0	12.0	8.0	11.0	14.0	12.0	10.0	11.0	6.0	15.0	11.0	11.0	12.0	11.0	9.0	11.0	10.0	10.0	12.0	10.0	11.0
NITROGEN, AMMONIA mg/l	00610	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.03	0.03	0.03	0.01	0.04	0.04	0.01	0.01	0.01	0.01	0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.18	0.18	0.18	0.18	0.19	0.17	0.16	0.19	0.18	0.17	0.17	0.18	0.17	0.17	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.18
NITROGEN ORGANIC mg/l	00605	0.12	0.12	0.12	0.12	0.16	0.12	0.16	0.12	0.16	0.16	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.16	0.08	0.08
IRON, TOTAL µg/l	01045	53	36	45	31	33	27	71	64	23	50	70	36	19	25	16	29	26	14	14	100	26	26	26
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.	31753	77	40	28	20	12	22	22	29	12	6	12	30	20	4	10	20	16	24	32	18	24	19	15
MF-TC PER 100 ml.	31503	6	6	2	2	0	0	4	0	2	0	0	8	0	0	0	4	0	0	0	6	2	8	4
MF-FC PER 100 ml.	31616	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679																							
PLANKTON PER ml.	60050	360		940		2200		1000	3100	920	200	1300	720	660	60	20	60	240	40		240		440	
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	C

METEOROLOGICAL DATA									PREVAILING WINDS
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	S	W	NW	W	W			W
VELOCITY	00035	2	5	3	3	4			

SURVEY BY J. ESPOSITO/J. VENCILL

REMARKS:
SUNNY, WINDS S - SW
WAVES CALM TO ONE FOOT

Table 36.

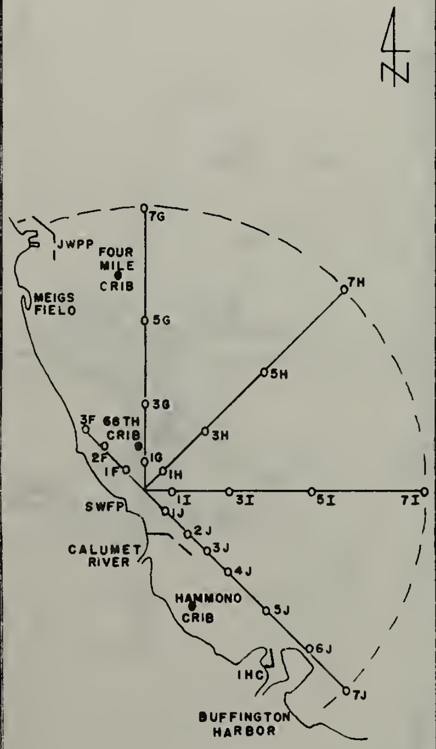
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

S.W.F.P. RADIAL LAKE SURVEY

DATE APRIL 22, 19 80



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER																					
		1F	2F	3F	1G	3G	5G	7G	1H	3H	5H	7H	1I	3I	5I	7I	1J	2J	3J	4J	5J	6J	7J
		CHW083	CHW078	CHW073	CHW084	CHW074	CHW065	CHW057	CHW085	CHW075	CHW066	CHW058	CHW086	CHW076	CHW067	CHW059	CHW087	CHW082	CHW077	CHW072	CHW068	CHW064	CHW060
TIME		1132	1137	1141	0926	0917	0903	0845	1158	1207	1221	1239	0935	0944	0958	1016	1123	1118	1114	1109	1100	1051	1042
TEMPERATURE °C	00010	8	8	8	7	6	5	5	7	6	5	4	7	7	5	5	8	8	8	7	7	7	7
TURBIDITY F.T.U.	00076	3.3	3.1	3.9	3.7	2.8	1.7	1.3	1.0	3.0	1.8	1.0	0.60	3.8	2.3	1.5	1.4	3.6	3.3	3.3	3.1	2.4	2.7
ODOR, THRESHOLD	00086	1M	1M	1M	1M	1M	1M	1M	1M	1M	1DM	1DM	1DM	1DM	1M	1M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	21.8	22.0	22.0	20.5	21.0	21.0	20.0	23.0	22.0	22.5	23.3	23.5	22.0	21.3	21.0	21.5	21.5	22.0	21.8	22.0	23.0	23.8
CHLORIDE mg/l	00940	10.8	11.0	11.4	11.0	10.0	10.0	9.9	11.3	10.5	10.1	10.0	10.6	10.2	10.0	9.9	10.8	10.7	10.8	10.7	10.2	10.8	10.7
PHOSPHATE, TOTAL mg/l	00650	0.04	0.07	0.07	0.07	0.06	0.07	0.09	0.07	0.07	0.07	0.07	0.03	0.03	0.05	0.07	0.03	0.02	0.03	0.06	0.04	0.06	0.07
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.03	0.03	0.01	0.03	0.02	<0.01	0.03	0.01	0.02	0.02	0.01	0.02	0.03	0.02	0.02	0.01	0.01	0.01	0.03	0.02
CONDUCTIVITY µ mhos	00095	295	295	295	295	290	290	290	295	290	285	280	295	290	290	290	295	295	295	295	295	300	300
RESIDUE, NONFILTRABLE mg/l	00530	1	0	3	4	6	5	3	17	4	5	11	5	2	9	1	20	0	3	0	2	3	0
OXYGEN DEMAND, CHEMICAL mg/l	00335	12.6	6.8	8.7	5.8	7.8	8.7	5.8	6.8	7.8	5.8	9.7	9.7	5.8	11.7	7.8	17.5	11.7	5.8	3.9	4.9	6.8	5.8
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02
NITROGEN, NITRITE-NITRATE mg/l	00630	0.25	0.25	0.27	0.24	0.20	0.20	0.17	0.23	0.20	0.19	0.18	0.27	0.22	0.20	0.21	0.27	0.25	0.24	0.24	0.23	0.26	0.27
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.16	0.12	0.12	0.12	0.16	0.12	0.12	0.20	0.20	0.20	0.20	0.08	0.20	0.16	0.16	0.16	0.20	0.12	0.16
IRON, TOTAL µg/l	01045	80	80	85	65	60	50	20	103	45	45	35	90	90	55	45	90	80	130	90	80	106	105
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.	31753	5	2	1	4	4	0	0	3	0	0	0	23	2	0	1	36	16	7	22	130	160	210
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679																0	0	0	0	0	0	0
PLANKTON PER ml.	60050	380	600	300	640	300	360	280	500	400	40	80	240	420	380	440	180	1120	620	540	1280	1180	1140
ACTINOS 14 DAY, 26°C PER ml.	80148	1	0	3	2	0	0	0	2	1	0	0	2	0	3	1	2	0	1	5	0	3	0
FUNGI PER ml.	31856	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200		
DIRECTION	00036	NW	NW	S	S	S		
VELOCITY	00035	5	7	8	9	10		

PREVAILING WINDS
00036
S

SURVEY BY: J. ESPOSITO/J. VENCILL

REMARKS:

Table 37.

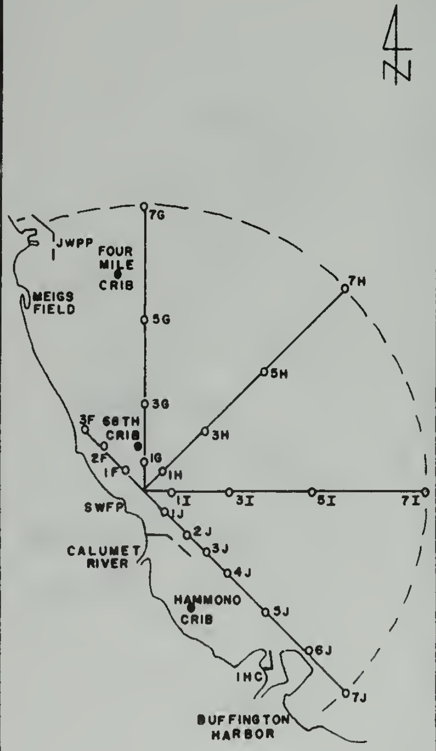
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

S.W.F.P. RADIAL LAKE SURVEY

DATE 5-28, 19 80



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER																				
		1F	2F	3F	1G	3G	5G	7G	1H	3H	5H	7H	1I	3I	5I	7I	1J	2J	3J	4J	5J	6J	7J
		CHW083	CHW079	CHW073	CHW084	CHW074	CHW065	CHW057	CHW085	CHW075	CHW066	CHW058	CHW086	CHW076	CHW067	CHW059	CHW087	CHW082	CHW077	CHW072	CHW068	CHW064	CHW060
TIME		1218	1222	1227	0924	0915	0901	0843	1242	1251	1305	1323	1207	1158	1144	1126	0933		0942		0954	1003	1012
TEMPERATURE °C	00010	15	15	15	15	15	13	15	15	14	14	14	15	15	15	13	14		14		15	14	16
TURBIDITY F.T.U.	00076	0.55	0.55	0.55	0.55	0.55	0.45	0.60	0.50	0.45	0.40	0.30	0.55	0.45	0.30	0.30	0.55		0.55		0.55	0.60	0.65
ODOR, THRESHOLD	00086	2DF	2DF	2DF	2M	1M	1M	1M	2M	1M	1M	1M	1DM	1M	1M	1M	2M		1M		2M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4		8.4		8.4	8.4	8.4
SULFATE mg/l	00945	23.5	24.0	23.5	23.5	23.5	23.5	23.5	24.0	23.0	23.3	22.8	23.5	23.5	23.5	23.0	23.8		24.3		24.5	24.0	26.5
CHLORIDE mg/l	00940	10.3	10.0	10.0	10.2	9.7	9.0	9.1	9.7	8.9	8.3	7.5	9.4	9.2	8.2	7.7	9.2		9.1		9.6	9.1	11.0
PHOSPHATE, TOTAL mg/l	00650	0.07	0.07	0.08	0.09	0.03	0.03	0.04	0.08	0.08	0.09	0.07	0.08	0.07	0.08	0.09	0.07		0.03		0.02	0.06	0.05
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.01	0.02	<.01	0.01	<.01	<.01	0.02	0.02	<.01	<.01	<.01	0.01	0.01	0.01		0.01		<.01	<.01	0.01
CONDUCTIVITY μ mhos	00095	290	290	290	295	295	295	295	290	290	285	285	280	285	280	280	295		295		300	295	305
RESIDUE, NONFILTRABLE mg/l	00530	7	1	5	11	14	15	9	2	6	4	16	4	0	7	15	6		2		5	8	9
OXYGEN DEMAND, CHEMICAL mg/l	00335	6.9	6.9	9.8	6.9	3.9	7.9	6.9	9.8	10.8	9.8	3.9	11.8	12.7	8.8	11.8	8.8		6.9		8.8	6.9	5.9
NITROGEN, AMMONIA mg/l	00610	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01		<.01		<.01	<.01	<.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.22	0.22	0.21	0.21	0.21	0.18	0.17	0.23	0.21	0.19	0.18	0.21	0.23	0.17	0.19	0.22		0.22		0.23	0.23	0.25
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.16	0.12	0.12	0.14	0.16	0.12	0.08	0.12	0.12	0.12	0.12	0.20	0.16		0.16		0.16	0.16	0.16
IRON, TOTAL μg/l	01045	30	20	10	<10	10	<10	<10	<10	10	15	<10	15	10	<10	<10	50		10		30	20	20
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1		<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.	31753	70	50	5	3	4	2	8	52	0	2	1	420	45	0	2	400		6		160	120	46
MF-TC PER 100 ml.	31503	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2		0		0	24	10
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0		0	0	0
PLANKTON PER ml.	60050	1160	-	1220	560	20	-	200	340	120	880	180	700	1180	80	180	220		760		520	-	-
ACTINOS 14 DAY, 28°C PER ml.	80148	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		0		1	0	0
FUNGI PER ml.	31856	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0		0		0	0	3

METEOROLOGICAL DATA								PREVAILING WINDS
TIME		0800	0900	1000	1100	1200		00036
DIRECTION	00036	S	S	S	S	S		S
VELOCITY	00035	8	10	10	14	14		

SURVEY BY. J. ESPOSITO/J. VENCILL

REMARKS: NO SAMPLE AT POINTS 2J AND 4J. IEPA DUPLICATE SAMPLES AT 5G, 5H, 5I, 5J AND 3F. SPLIT PESTICIDE SAMPLE COLLECTED AT 5J.

Table 38.

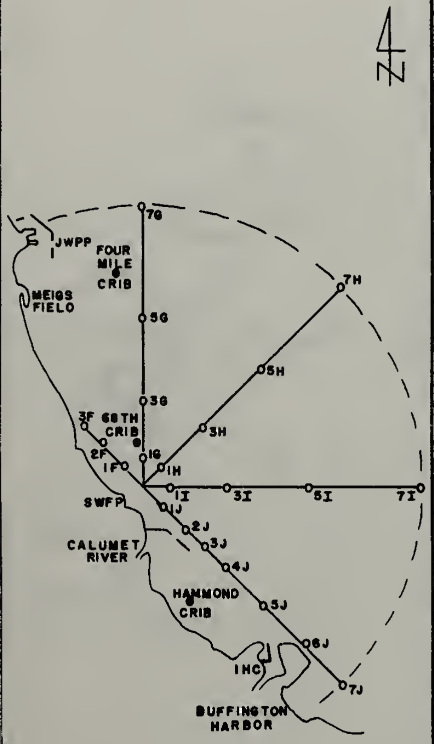
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

S.W.F.P. RADIAL LAKE SURVEY

DATE July 22, 19 80



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER																					
		1F	2F	3F	1G	3G	5G	7G	1H	3H	5H	7H	1I	3I	5I	7I	1J	2J	3J	4J	5J	6J	7J
		CHW083	CHW078	CHW073	CHW084	CHW074	CHW065	CHW057	CHW085	CHW075	CHW066	CHW058	CHW086	CHW076	CHW067	CHW059	CHW087	CHW082	CHW077	CHW072	CHW068	CHW064	CHW060
TIME		1122	1126	1131	0915	0906	0853	0835	1149	1158			0925	0934	0948	1006	1113	1108	1104	1059	1050	1041	1032
TEMPERATURE °C	00010	20	20	20	21	21	21	21	20	20			21	21	21	21	20	20	20	21	21	20	21
TURBIDITY F.T.U.	00076	0.50	0.50	0.55	0.45	0.50	0.45	0.45	0.50	0.45			0.50	0.55	0.55	0.40	0.55	0.50	0.65	0.75	0.55	0.60	0.50
ODOR, THRESHOLD	00086	1M	1M	1M	1M	1M	1M	1M	1M	1M			1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5			8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
SULFATE mg/l	00945	20.5	20.0	20.0	20.0	21.0	20.5	20.5	21.0	20.5			20.8	20.0	21.0	21.5	21.0	20.5	21.0	21.5	21.0	21.5	21.0
CHLORIDE mg/l	00940	9.1	8.7	8.2	8.9	8.7	8.1	7.7	8.8	8.6			8.7	8.8	8.7	9.1	9.1	8.6	8.3	9.1	8.7	8.6	8.5
PHOSPHATE, TOTAL mg/l	00650	0.04	0.04	0.04	0.05	0.01	0.02	0.04	0.01	0.02			0.02	0.02	0.01	0.06	0.04	0.06	0.04	0.05	0.02	0.03	0.04
PHOSPHATE, DISSOLVED mg/l	00653	0.01	<.01	0.01	0.01	<.01	0.01	<.01	<.01	<.01			<.01	<.01	<.01	0.01	<.01	0.01	<.01	<.01	<.01	<.01	<.01
CONDUCTIVITY µ mhos	00095	290	290	290	290	290	290	290	290	290			285	290	290	290	285	290	290	290	290	290	290
RESIDUE, NONFILTRABLE mg/l	00530	23	20	16	16	2[illegible]	18	2[illegible]	5	20			2	3	7	6	10	11	15	13	0	2	4
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.5	8.4	10.3	8.4	10.3	12.1	8.4	8.4	4.7			10.3	8.4	10.3	5.6	9.3	10.3	8.4	12.1	8.4	8.4	11.2
NITROGEN, AMMONIA mg/l	00610	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.01	0.01			0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.03	0.01	0.01	0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.20	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19			0.20	0.20	0.20	0.20	0.21	0.19	0.20	0.21	0.19	0.18	0.20
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.12	0.16	0.16	0.16	0.08	0.16			0.20	0.16	0.16	0.16	0.16	0.20	0.20	0.20	0.20	0.20	0.16
IRON, TOTAL µg/l	01045	16	10	12	<10	12	10	14	10	11			18	12	12	12	15	15	16	14	13	13	15
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.	31753	84	44	66	120	78	52	22	360	620			89	460	130	66	460	390	2000	1700	44	620	49
MF-TC PER 100 ml.	31503	4	0	6	0	0	0	0	2	6			2	4	4	0	24	8	134	14	0	4	0
MF-FC PER 100 ml.	31616	8	0	8	0	0	2	0	2	8			0	10	0	0	0	2	130	28	0	6	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-			-	-	-	-	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	260	-	300	440	500	260	-	180	0			40	260	1260	20	420	-	540	-	120	-	660
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	0	2			1	1	0	0	0	0	2	0	0	0	0
FUNGI PER ml.	31856	1	0	0	1	0	0	0	0	0			0	1	0	0	0	0	0	1	0	1	0

METEOROLOGICAL DATA									PREVAILING WINDS
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	N	N	N	N	N			N
VELOCITY	00035	10	7	6	8	12			

SURVEY BY: J. Esposito/J. Vencill

REMARKS: Windy; Waves 3 - 6 ft.

Table 39.

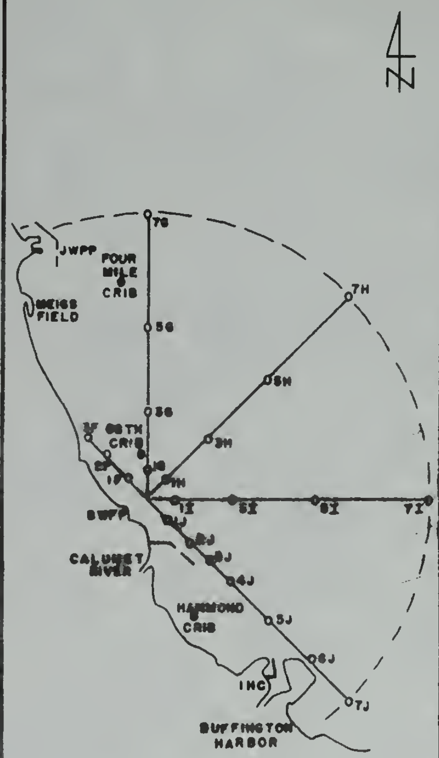
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

S.W.F.P. RADIAL LAKE SURVEY

DATE October 16, 1980



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER																					
		1F	2F	3F	1G	3G	5G	7G	1H	3H	5H	7H	1I	3I	5I	7I	1J	2J	3J	4J	5J	6J	7J
		CHW083	CHW078	CHW073	CHW084	CHW074	CHW065	CHW057	CHW066	CHW075	CHW086	CHW058	CHW086	CHW079	CHW067	CHW069	CHW087	CHW082	CHW077	CHW072	CHW068	CHW064	CHW060
TIME		1134	1137	1142	0923	0914	0900	0842	1202	1211	1225	1243	0938	0947	1001	1019	1125	1121	1116	1112	1103	1054	1045
TEMPERATURE °C	00010	12	12	12	11	11	11	11	11	12	12	12	11	11	11	11	11	12	12	12	12	11	11
TURBIDITY F.T.U.	00076	3.0	3.4	4.6	2.0	2.0	0.90	0.75	2.0	1.6	1.3	0.90	1.6	1.5	1.4	0.80	2.9	2.0	2.6	2.2	1.8	1.8	1.4
ODOR, THRESHOLD	00086	2G	1G	1G	2G	1M	1M	2G	1M	1M	1M	1M	2M	1M	1M	1M	2G	1G	2G	1G	1G	1G	2M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.0	21.0	20.5	20.5	20.0	20.0	20.0	20.5	20.5	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.8	20.0	20.0	20.0	22.0	20.0
CHLORIDE mg/l	00940	8.8	8.9	8.2	7.7	7.8	7.6	8.1	7.8	7.8	7.0	7.5	7.6	8.0	7.7	7.8	7.7	7.7	7.1	7.8	8.1	8.2	8.0
PHOSPHATE, TOTAL mg/l	00650	0.06	0.06	0.08	0.04	0.08	0.04	0.06	0.06	0.03	0.03	0.03	0.05	0.04	0.04	0.06	0.05	0.05	0.06	0.05	0.06	0.07	0.07
PHOSPHATE, DISSOLVED mg/l	00653	0.02	0.01	<.01	0.01	0.01	0.01	0.01	0.02	0.01	<.01	<.01	<.01	<.01	0.01	<.01	0.01	0.01	<.01	0.01	0.01	0.01	0.01
CONDUCTIVITY μ mhos	00095	285	285	285	285	285	285	290	290	285	285	280	285	290	270	280	280	285	290	280	290	285	280
RESIDUE NONFILTRABLE mg/l	00530	32	12	17	24	0	6	2	13	8	7	17	0	6	2	0	22	5	6	15	10	4	10
OXYGEN DEMAND, CHEMICAL mg/l	00335	5.9	6.8	7.8	4.9	6.8	6.8	5.9	5.9	6.8	7.8	6.8	5.9	5.9	7.8	6.8	9.8	5.9	6.8	8.8	10.8	10.8	10.8
NITROGEN, AMMONIA mg/l	00610	0.02	0.03	0.03	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.04	0.02	0.03	0.02	0.02	<.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.18	0.19	0.19	0.18	0.18	0.18	0.19	0.19	0.20	0.19
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.08	0.08	0.16	0.16	0.16	0.12	0.16	0.12	0.16	0.20	0.20	0.16	0.16
IRON, TOTAL μg/l	01045	42	36	28	16	12	<10	<10	16	<10	<10	10	<10	22	<10	<10	12	14	12	16	15	<10	<10
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNY 48hr., 35°C PER ml.	31753	3	14	10	8	8	27	0	5	1	4	20	1	8	16	5	19	7	0	1	110	960	3
MF-TC PER 100 ml.	31503	6	10	14	8	4	0	2	10	0	2	0	2	0	2	0	10	8	8	2	30	128	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	18	0
MF-FS PER 100 ml.	31679																						
PLANKTON PER ml.	60050	1100	2500	2100	1400	2100	640	1600	600	780	1100	200	1500	1400	740	580	1900		1100		2100		940
ACTINOS 14 DAY, 26°C PER ml.	80148	0	1	2	1	0	0	0	1	0	1	0	1	0	0	0	1	0	1	1	0	0	0
FUNGI PER ml.	31856	0	2	2	2	0	0	1	1	1	3	0	2	2	1	3	0	1	2	1	0	0	1

METEOROLOGICAL DATA								PREVAILING WINDS
TIME		0800	0900	1000	1100	1200		00036
DIRECTION	00036	S	SW	SW	SW	S		SW
VELOCITY	00035	5	6	10	10	7		

SURVEY BY: J. Esposito/J. Vencill

REMARKS: Lake Condition: 3 ft swells

Table 40. Detection limits and guidelines for nine metals and ten chlorinated hydrocarbons in water, sediment and fish.

	Water		Sediment		Fish	
Parameters	Detection limit (ug/1)	Standard (IPCB, 1977) (ug/1)	Detection limit (ug/g)	Highly Elevated(c) (ug/g)	Detection limit (ug/g)	Action Levels(d) (ug/g)
Lead (Total)	10	50[a]	5.0	> 150	-	-
Copper (Total)	4	20[b]	1.0	> 150	-	-
Iron (Total)	30	300[a]	50.0	>45000	-	-
Mercury (Total)	0.05	0.5[b]	0.5	> 0.40	0.01	1.0
Zinc (Total)	10	1000[b]	1.0	> 250	-	-
Manganese (Total)	10	50[a]	5.0	>3900	-	-
Arsenic (Total)	1	100[a]	-	> 41	-	-
Cadmium (Total)	4	10[a]	0.5	> 2.6	-	-
Chromium (Total)	10	50[a]	1.0	> 38	-	-
Total PCB's	0.1	-	10 ug/kg	-	0.01	5.0
Dieldrin	0.01	1.0[a]	1 ug/kg	-	0.01	0.3
Chlordane	0.02	3.0[a]	5 ug/kg	-	0.01	0.3
Total DDT	0.01	50[a]	10 ug/kg	-	0.01	5.0
Heptachlor epoxide	0.01	0.1[a]	1 ug/kg	-	0.01	0.3
Lindane	0.01	5.0[a]	1 ug/kg	-	0.01	-
Aldrin	0.01	1.0[a]	1 ug/kg	-	0.01	-
Endrin	0.01	0.5[a]	1 ug/kg	-	0.01	-
Heptachlor	0.01	0.1[a]	1 ug/kg	-	0.01	-
Methoxychlor	0.05	100[a]	5 ug/kg	-	0.01	-
Hexachlorocyclohexane	0.01	-	-	-	-	-
Hexachlorobenzene	0.01	-	-	-	-	-

a) Public and food processing water supplies.
b) General use.
c) (Kelly and Hite, 1981).
d) USFDA action limits are for the edible filet portion of a fish.

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